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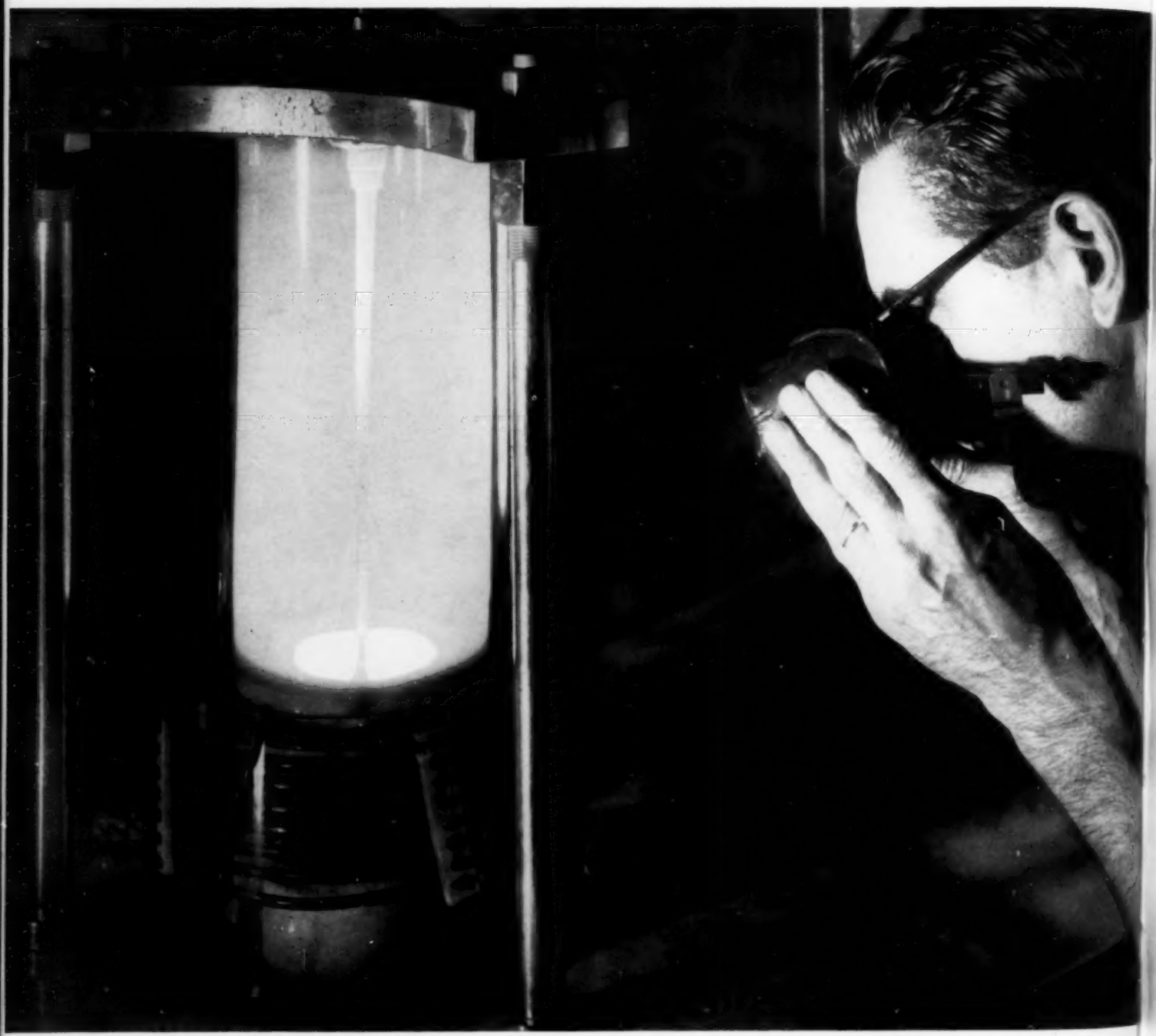
Battelle Technical Review

IN THIS ISSUE:

Chemicals and Concrete

The forming of large single crystals of semiconductor materials is an all-important first step in research on rectifiers and transistors. The induction heating furnace in use here can be utilized for pulling crystals of materials with melting points up to about 1500 C. Single crystals of germanium, silicon, and the intermetallics indium antimonide and aluminum antimonide have been formed in this furnace. Pulling the crystals is a delicate and painstaking operation which requires constant vigilance.



CRYSTAL PULLING

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July 1957

BATTELLE TECHNICAL REVIEW

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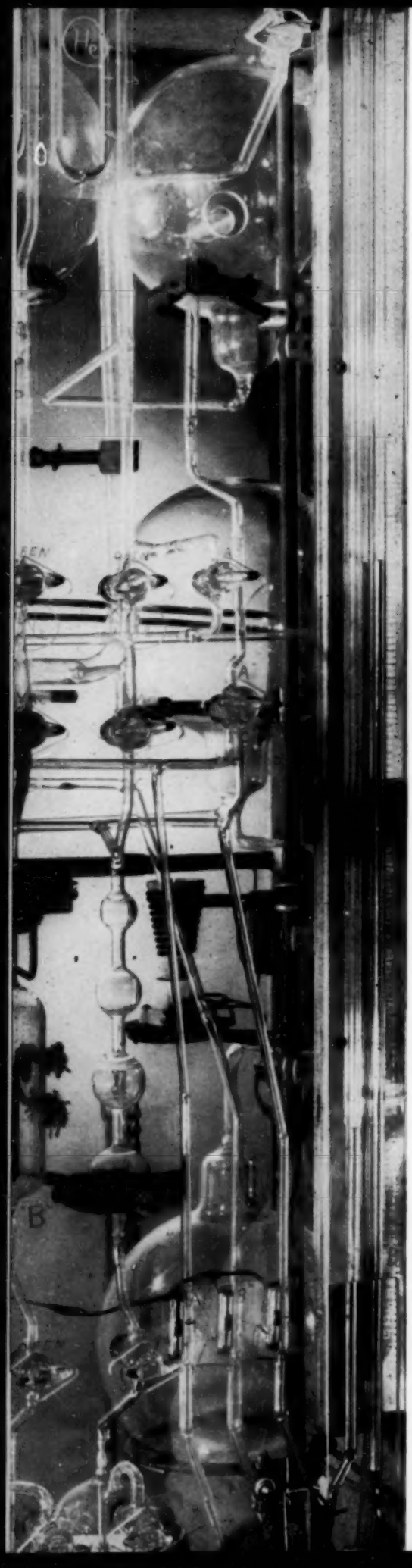

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Abstracts of articles and papers in a wide variety of technological fields from more than 1350 journals published throughout the world. Abstract selection largely reflects the primary areas of Battelle research.

Education for Responsibility

"Of all the education effort that is being expended today, there is none more important than that in science and engineering. I can hear a storm of protest from those who will say: the trouble with engineering education is that it does not include enough work in the humanities. Considering the nature of the world in which we live today, it seems more appropriate to say: the trouble with education today, in the humanities or in anything else, is that it does not provide enough understanding of science and engineering.

"Our daily lives are so filled with manifestations of our own technical attainment that it is dangerous for us to ignore its effect on our social mores and to fail to adjust our lives to a pattern more in conformance with this reality. Fifty years ago the world could be run adequately with a few thousand engineers supplementing the work of its political leaders. Today, hundreds of thousands of engineers are needed, and the political leaders seem helpless to deal with the realities of atomic fission, peaceful or otherwise. Where is education needed most?

" . . . what is a good education for an engineer? First of all, there is the formal knowledge that he must have of mathematics, physics, and chemistry. . .

"Much has also been said about language and communication for the engineer . . .

"But there is another facet in an engineering education that needs to be polished to make a well-educated graduate. This is a sense of belonging to the world in which he lives. Knowing that he is one of a large group of similar persons who are continually changing that world and being changed by it, he should recognize clearly his own significance in this era of change. We have seen how formal education represents a control element built into the social network. Somehow we must see to it that our schools turn out graduates who recognize this function in our society, who comprehend the enormous responsibility that it entails and who accept that responsibility with as much awareness as they are capable of."

Excerpts from "The Dynamics of Education", an address by Dr. B. D. Thomas, Battelle director, at the Michigan College of Mining and Technology on the occasion of the inauguration of its new president, Dr. J. Robert Van Pelt.

VIGNETTE

LEADER IN RESEARCH MANAGEMENT

EDWARD E. SLOWTER

The growing demands for scientific and engineering accomplishment create ever new problems for organizations responsible for research and development. To meet them, according to Edward E. Slowter, vice president and associate director of Battelle, such organizations must keep their administrative, as well as technical procedures, fluid. Thus, he points out, the desire for shortening the period between attack on a technical problem and the military or industrial application of useful findings calls for constant modification of research approaches.

Ed, who was an accomplished technologist before turning to administrative responsibilities, knows that the business functions of research organizations must both complement and support the research functions. Hence, he has striven by study and application of sound administrative practices and selection and utilization of the most effective equipment to give Battelle technologists the greatest possible aid in the fulfillment of their research assignments. As a member of the Institute's executive committee, Ed shares the responsibility for keeping over-all management functions in step with the increasing demands upon it.

In his early years at Battelle, Ed conducted studies in the then new field of the heat treatment of metals in controlled atmospheres. He also participated in pioneer work at the Institute on the vapor deposition of metals. As he made the gradual transition from technical to administrative responsibilities, he came to realize more and more the need to consider the effects of technology upon the economic, social, and other aspects of man's life. It is Ed's belief that to serve mankind best, the scientist and engineer must take active roles in public affairs so that their accomplishments may be best utilized for the welfare of all.

Despite his heavy responsibilities, Ed participates in professional activities as well as civic and church affairs. He speaks regularly on professional and research management problems. In his earlier years, he authored numerous research papers. These papers, as a reflection of his work, were a factor in his being granted an honorary professional engineering degree from The Ohio State University. It was from that school that he had received B.S. and M.S. degrees in chemical engineering. Even during his military service, Ed was professionally active, receiving the Army Commendation Ribbon for his contributions to the development of anti-aircraft fire control procedures. He is an active member of the American Institute of Chemical Engineers, the American Management Association, and the Ohio and National Societies of Professional Engineers.

Developments in Rock Drilling

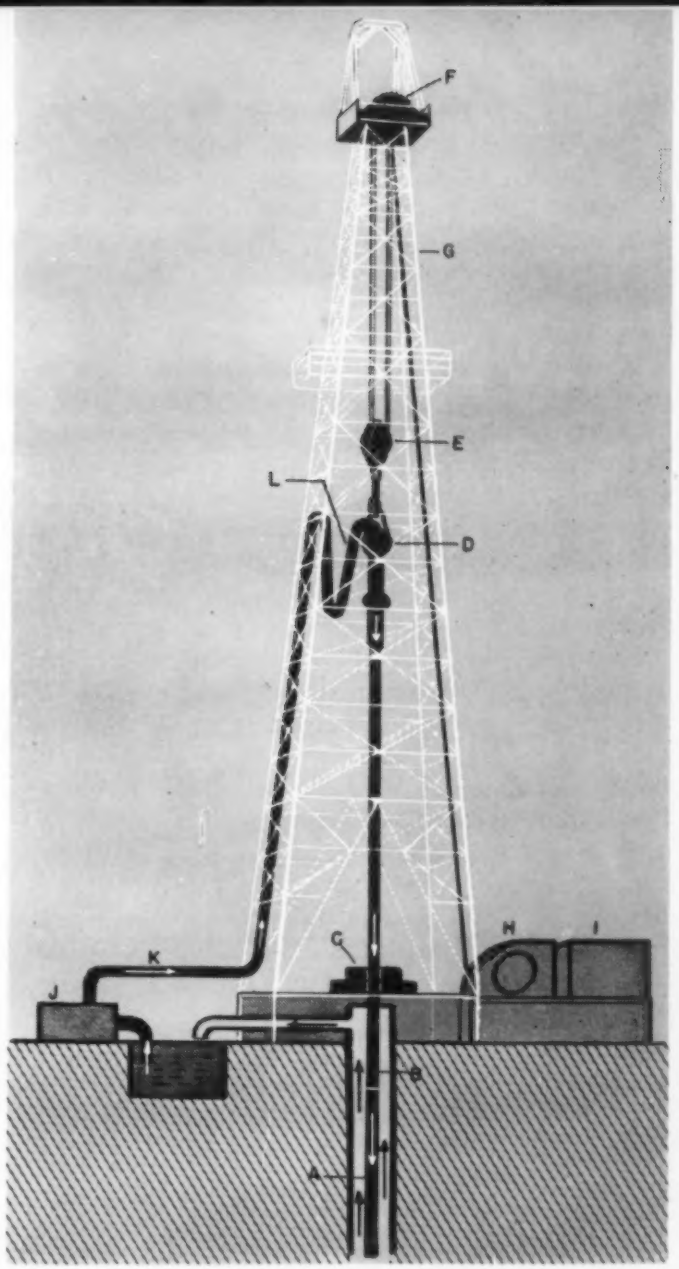
by Ralph Simon

As the necessity for deeper oil wells grows, the drilling industry is becoming increasingly concerned about developing more efficient drilling methods. The author reviews rotary and turbodrill techniques and discusses in some detail rock drilling by vibratory methods.

Rock drilling is of great importance in many industries. Because of the tremendous depths involved, the performance of rock drills is of primary importance to the petroleum production industry. Less spectacular, but of great economic importance, is rock drilling for the purpose of making blast holes for mining, quarrying, and the construction of roads, tunnels, conduits, dams, and building foundations. Other applications of rock drilling include core drilling, exploration drilling, and the drilling of water wells and gas wells.

Oil Well Drilling

More than 90 per cent of the new oil wells in this country today are being drilled by rotary drilling, a method introduced at about the turn of the century. The older technique of cable-tool drilling is still widely employed in many regions for drilling shallower wells into certain types of rock formations for which this method is applicable.



Schematic drawing of the basic drilling rig apparatus at the top of the hole for rotary drilling. The parts shown are: **A**–*drill pipe;* **B**–*kelly (square pipe);* **C**–*rotary table;* **D**–*Swivel;* **E**–*travelling block;* **F**–*crown block;* **G**–*derrick;* **H**–*draw works;* **I**–*engines;* **J**–*slush pump (for drilling fluid);* **K**–*mud flow lines;* **L**–*mud hose. The rotary table would not be required for turbine drilling, though a more powerful pump would be needed for the drilling fluid. For vibratory drilling, an electrical transmission line would be required in the drill pipe. It would be connected to an alternating current generator through slip rings mounted on the swivel.*

Rotary Drilling

The principle of rotary drilling is illustrated in sketch "A" on page 5. A rotary rock bit is forced into the rock formation being drilled by the weight of the drill collar placed above it. The drill collar consists of coupled sections of thick-walled tubing, up to several hundred feet in length, depending on the load desired. The top of the drill collar is joined to coupled sections of drill pipe, extending to the top

of the hole. The whole drill string is rotated at the top of the hole; and the rock cuttings are removed by circulating a drilling fluid, normally down the central passage and up the annular space between the drill string and the sides of the hole. The drilling fluid may be air, water, or various "muds", depending upon the other functions it is called on to perform in the rock formation being drilled.

Within limits the rate of penetration into rock, by rotary drilling methods, increases as the load on the bit is increased and as the rate of rotation is increased. Great strides have been made in the past 50 years in improving equipment and techniques to obtain increased rates of penetration. The continual development of ever better and stronger bits by the bit manufacturers, both in mechanical design and in metallurgy, has contributed a major portion of this success. The teeth of a bit are the most critical parts of its structure; they must be made strong enough to support the increased loads and hard enough to resist the increased wear which accompanies heavier loading. In one currently used bit, designed for drilling into extremely hard formations, rounded carbide inserts projecting slightly out of the surfaces of the cones perform the functions of the teeth. The cone bearings are also critical; they must continue to perform their function without excessive wear in the face of increasing thrust loads and increasing rotation rates, often in the presence of abrasive drilling fluids.

Drillers have long recognized that the limitations on the method would increasingly make themselves felt as deeper holes were drilled to exploit new oil reservoirs. The method's limits of effectiveness are now being approached as 15,000-foot-deep and deeper holes are becoming more common.

Rotary Drilling Problems

In drilling, up to two-thirds of the rig-operating time may be spent in the "round trips" required to change bits, depending upon the depth of the hole. These round trips involve pulling up and decoupling the drill string in lengths which depend upon the height of the derrick, replacing the bit, and recoupling the drill string. Since rig-operating time is a major factor in drilling costs, it is desirable to drill as much footage as possible with each bit in order to decrease the number of round trips. At the same time, it is important to drill as rapidly as possible with each bit. Consequently, the cost per foot of hole of drilling an oil well increases slowly at first, and then skyrockets as the depth of the hole increases.

As the hole gets deeper, more and more torque must be applied at the surface to maintain a given rate of rotation of the bit, because of the increased frictional losses on the sides of the hole and the increased viscous losses into the drilling fluid as the drill string gets longer. About five to ten times more rotary power must be supplied at the top of a 15,000-foot hole than is required to turn the bit at the bottom. This entails the need for larger power generating and transmitting equipment for drilling deeper holes, as well as higher strength drill pipe near the top of the hole because of the increased torsion stress. It can also be seen that the deeper the hole, the more drill pipe is being worn out by friction and corrosion per foot of hole drilled. There are thus physical limitations and economic costs which make increasingly difficult the drilling of holes by rotating at the top of the hole.

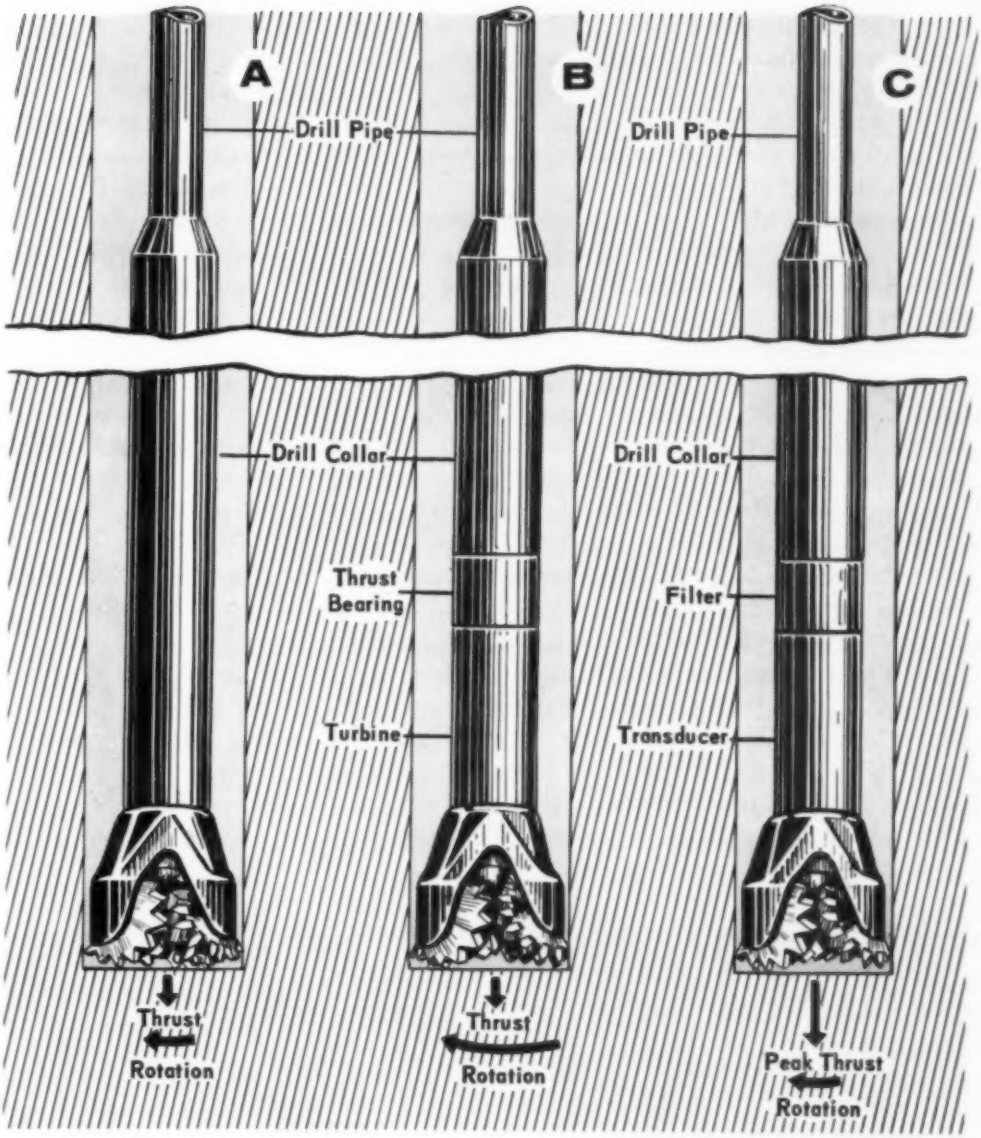
Another limiting factor in deep-hole rotary drilling is the fact that the rate of penetration of a given bit into a given rock at constant rotation rate and load tends to decrease as the hole gets deeper, imperceptibly at first and then more precipitously. Like any brittle material, rock becomes less brittle and more ductile as the confining pressure is increased. For some rocks, the transition from essentially brittle to essentially ductile behavior, under loading such as imposed by the teeth of a bit, occurs at pressures as low as 2,000 psi. With increasing confining pressure, the teeth of a bit must do more and more "cold-working" of the rock before a rock fragment breaks off. This reduces the number of the tooth loadings that produce large fragments and, hence, results in a lower rate of penetration than for brittle rock. These effects of pressure on the drillability and on other properties of rock are being intensively studied in the laboratories of the Hughes Tool Company, Shell Development Company, and several other organizations.

Dr. Simon has been associated with research on vibratory rock drilling for more than six years, starting with an examination of the basics of rock drilling and more recently participating in the development of vibratory methods for drilling. He has studied other research problems involving vibration and sound as well as noise control, static and dynamic stress analysis of dynamic systems. Before joining Battelle, he was on the staff of the ultrasonics laboratory at Pennsylvania State University after having served as Chief of the Sound Section at the Evans Signal Laboratory of the U. S. Signal Corps.

The Turbodrill

One method of overcoming the problems created by the need to turn the entire drill string in a deep hole would be to rotate the bit only at the bottom of the hole. This is the principle of the turbodrill, as illustrated schematically in sketch "B" on this page. In this method, the bit is rotated at 600 to over 1000 rpm by means of a turbine operated by the flow of the drilling fluid, and the load is applied through a thrust bearing. This compares with 100 to 200 rpm for rotary drilling. Rates of penetration in deep holes of about one and one-half to five times those of rotary drilling have been reported.

The earliest known record of a turbodrill is found in an American patent issued to Dr. C. G. Cross in 1873 for a single-stage turbodrill. In 1922, C. C. Sharpenberg, at the Standard Oil Company of California, obtained a patent on a multi-stage turbodrill; and many organizations in this country and abroad have been engaged in the development of turbodrills at one time or another in the past 35 years. Although the principle of the turbodrill is simple, its practical embodiment presents many difficulties, not the least of which is the sealing of bearings from the high-pressure, abrasive drilling fluid.



The sketches illustrate the principles involved in **A***—rotary drilling;* **B***—turbo drilling; and* **C***—vibratory drilling. The sections of the various drill strings are not necessarily shown in true proportion. The arrows at the bottom of each string indicate the relative importance of thrust and rotation in each type.*

The Russians must be credited with the development of the first practical turbodrill in 1948 which substitutes multiple-disk, sliding rubber thrust bearings for steel roller or ball bearings. It has been reported that the turbodrill has largely supplanted the rotary drill in Russia and that it is used for over 80 per cent of their current drilling. A French company, Etablissements Neyrpic, has also recently designed a turbodrill, based on the Russian development. Forty Russian turbodrills have been imported for tests in the U.S. by Dresser Industries, who are also testing the French development.

Vibratory Drilling

A study of the fundamentals of the process of rock drilling conducted at Battelle showed that the rate of penetration of a bit into rock depended directly on the mechanical power input to the rock. In both rotary drilling and turbodrilling, the mechanical power input to the rock is developed by the rotation of the bit. The torque reaction to rotation results from the sink-

ing of the teeth of the bit into the rock, their penetration being produced by the thrust load.

Greater mechanical power is developed at the rock by the turbodrill because it rotates faster. It would also seem reasonable to increase the mechanical power input to the rock at the lower rotation rates by increasing the coupling of the bit to the rock so that a greater torque reaction is developed when the bit is rotated. Since the "static load" on the bit in rotary drilling and the thrust force in turbodrilling are both limited by practical considerations, the increased coupling must be obtained in some other way, such as by vibrating the bit. This is the principle of vibratory drilling. By vibrating the bit, varying forces are developed between the bit and the rock whose peak magnitude may be several times the static load on the bit, as illustrated schematically in sketch "C", page 5.

A vibratory drilling machine, driven by a magnetostriction transducer, is under development at Battelle for Drilling Research, Incorporated. This organization, formed by companies engaged in various phases of oil production, was established to investigate novel methods of rock drilling. The Battelle transducer and associated apparatus is shown in the photograph on page ... The transducer is essentially a column of a material (in this case nickel) whose length changes slightly when magnetized. A high level of vibration can be developed by employing an alternating magnetizing current at a resonant frequency of the column, in this case 300 cycles per second. Rates of penetration of two to three times those obtained with rotary drilling have been achieved with laboratory models and with a preliminary field model.

Since the magnetostriction motor can produce reciprocating motion without the use of relatively sliding or rolling parts, it offers a distinct advantage in operation in an abrasive fluid under pressure. The development of a vibratory drilling machine for successful operation down a deep hole has involved the solutions of many problems. These included the transmission of electrical power down the drill string and the development of vibration isolation systems to prevent excessive vibratory power losses into the drill string and into the drilling fluid.

Several other devices are being developed that utilize the principle of vibration drilling. A notable example is the Bodine Sonic Drill under development by the Borg-Warner Corporation. In this equipment, the bit is vibrated at about 60 cycles per second by means of turbine-rotated eccentric weights driving a resonant steel column.

Vibratory drilling permits an increase of mechanical

The working end of a vibratory drill string, developed at Battelle, being prepared for a trial run. The sections included in the string, starting from the end toward the camera, include: a telemetering section to provide information, during trial runs, about the operation of the string; the filter, which protects the remainder of the drill string from vibration; the down-hole drilling motor, which is a magnetostrictive transducer; and finally, at the far end, the bit sub containing a strain gauge to show the weight of the drill string.

power input to the rock not only by increasing the torque reaction to rotation, but also by the vibratory motion itself feeding mechanical power into the rock. As the amplitude of vibration is increased, the bit may begin to lose contact with the rock for a fraction of the cycle of vibration. This occurs at lower amplitudes of vibration for the lower static loads or for the harder rocks. At still greater amplitudes of vibration, the action of the bit may become that of a series of impacts, each lasting for a small fraction of the cycle of vibration. The mechanical power input to the rock may then be generated primarily by the vibratory motion instead of by the rotation; and the result is, strictly speaking, percussion drilling instead of vibratory drilling.

Blast Hole Drilling

Percussion drilling is almost universally used for drilling blast holes. Pneumatically operated devices with a piston striking an anvil at the top of the bit or at the top of a length of steel to which the bit is attached are commonly used. Percussion frequencies may range from five to 60 per second or more, depending upon the type of bit, type of rock, and diameter and depth of hole. The ordinary jack hammer is an example of such a device. Solid-head bits with radial wings of steel or of tugnsten carbide are ordinarily used for percussion drilling.

Improvements in mechanical design and in metallurgy of drill steels and bits have permitted the use of more energetic or more frequent blows, thereby increasing the mechanical power input to the rock without excessive bit wear or steel breakage. The various phenomena involved in the transfer of energy from the striking piston into the rock have been little understood in the past. Considerable progress in this understanding was achieved as the result of a study conducted at Battelle for the Ingersoll-Rand Company on the propagation of stress waves in the piston, steel, and bit. Designs of new models of drilling machines are expected to be influenced by the results of this fundamental work.

A noteworthy new development in blast-hole drilling is rotary-percussion drilling, which is being studied at the University of Minnesota and elsewhere. Rotation of the bit in ordinary percussion drilling is primarily for the purpose of "indexing", or changing the positions on the rock for successive impacts. In the new development, equipment design and operating conditions are so altered that an appreciable amount of additional mechanical power is developed in the rock by increasing the torque reaction to rotation. Thus, rotary drilling is improved by introducing vibration or percussion, while percussion drilling is improved by introducing some rotary power.

Another development in blast-hole drilling is jet piercing, whereby a high-temperature jet of burning gases is directed at the bottom of the hole. The stresses produced in the rock by the resultant large temperature gradients may be great enough to cause spalling of the rock, the fragments being removed by the exhaust gases. This method is economically competitive for drilling into exceedingly hard and tough formations, such as in some of the taconite iron ore deposits of the Mesabi Range.

It is to be noted that no mention has been made of drilling rock by ultrasonics or by atomic energy. Radically different methods of rock drilling are continuously being conceived and some reach various stages of development. So far, none of these even begin to compete in efficiency with the developments discussed above.

However, research in the future, as in the past, is likely to provide faster and better rock drilling methods.

"There is no human intellect, however great in genius, which cannot find a challenge worthy of its power in contemplating the structure of the atomic nucleus, the nature of the chemical bond, the physiology of a living organism, the meaning of life, or the origin and the future of the universe. The more a university or any other agency engaged in basic research can stick to the goal of unrestricted human thought, the less likely the great intellects are to be deterred from direct contact with the great unanswered questions of science."

Glenn T. Seaborg in
Chemical and Engineering News

Chemicals and Concrete

Chemical additions are helping to make concrete an increasingly versatile material with new potential applications. The increasing demand for the material, along with research, is opening new marketing opportunities for chemical producers.

by M. Jack Snyder *and* Niles G. Foss

The average American citizen is surrounded by concrete from the day he is born in a reinforced-concrete hospital until he is buried perhaps in a concrete grave vault. The house in which he lives is built on a foundation of concrete or concrete blocks, perhaps even its exterior is covered with a type of concrete called stucco. The water he drinks probably flowed through a concrete pipe sometime in its journey to his glass. Much of the food and beverages he consumes was processed in a cannery, dairy, brewery, or distillery built of sanitary concrete. When he leaves his house for work, he travels on concrete porches, steps, sidewalks, driveways, streets, highways, bridges, and tunnels. His office is probably in a reinforced-concrete building. On week ends, he relaxes in a concrete swimming pool or attends a sporting event or concert seated in a concrete stadium or auditorium.

The two major industries that supply the raw materials for concrete, portland cement and aggregate, are sizable industries. In the United States during 1955, approximately 55 million tons of portland cement valued at nearly $800 million was produced. About 250 million tons of sand, gravel, limestone, and slag, having a value of around $250 million, was added to make about two million cubic yards of concrete valued at nearly $3 billion in place. The production of cement for 1955 represents a nearly three-fold increase over 10 years ago. This rate of growth is expected to continue at least through 1959.

During 1953—the latest year for which complete data on raw materials are available—the Bureau of Mines reported that almost 85 million tons of raw materials entered into the manufacture of 50 million tons of portland cement in the United States.

Many industries play vital parts in the production of cement, while many additional industries are concerned with the use of cement and concrete. The ready-mixed concrete, concrete block, and concrete pipe industries owe their existence to this material. Tremendous quantities of concrete are used every day by the contracting firms that build our houses, buildings, highways, bridges, and dams. The manufacturers of machinery for mixing, transporting, placing, and finishing cast-in-place concrete structures, and for forming and curing precast concrete objects have a vital interest in concrete.

Although the chemical industry provides materials that comprise an essential part of much of the concrete used, the connection between the chemical and concrete industries is less obvious to the casual observer than is the case with most of the other industries mentioned. Concrete is a versatile material in itself, but the addition of relatively small amounts of chemicals to concrete greatly increases the number of uses to which it can be put.

Chemicals in Concrete

Cement and concrete technologists make a distinction between chemicals added to cement by the cement manufacturers and chemicals added to concrete at the mixer or job site. When chemicals are added during the manufacture of the cement, they are called "additions"; when they are added to the concrete at the mixer, they are known as "admixtures". For most

SUMMARY OF THE MAJOR CHEMICALS USED WITH CONCRETE

Type of Chemical	Primary Purpose	Specific Chemicals
Accelerators and Retarders	Shorten or lengthen the time over which concrete will remain workable after mixing, or to vary the rate of strength development	Gypsum Calcium chloride Triethanolamine Soluble silicate Fluosilicates Copper sulfate Sodium phosphate Boron compounds Sodium bicarbonate Various starches and sugars Hydroxy acids Calcium lignosulfonate Carbohydrate salts
Air-Entrainment Agents	Reduce damage to concrete caused by freezing and thawing and by attack by ice-removing salts	Alcohol sulfates Alkyl sulfonates Resin soaps Saponin Casein
"Waterproofing" and Water Resistant Agents	Prevent transfer of moisture through concrete structure	Metallic soaps Asphalt emulsions Silicones Calcium stearate
Plasticizers	Provide better resiliency and tensile strength for concrete	Asphalt emulsions Polyvinyl acetate Rubber latex
Fungicidal Additives	Lessen the deterioration of concrete by inhibiting the growth of bacteria and fungi	Copper oxychloride Copper acetoarsenate Copper oxides Pentachlorophenol
Curing Compounds	Develop better strength of the concrete by retarding water evaporation in the mixture during the curing stage	Paraffin Petrolatum Microcrystalline wax Cumar and terpene resins Calcium chloride
Surface Sealers	Reduce dust accumulation by hardening surface of the concrete	Sodium silicate Fluoride salts Linseed Oil

purposes, the end result is the same. For simplicity, therefore, we shall use the term "addition" to cover either case.

The use of chemicals to alter the properties of cement and concrete is as old as the use of cement itself. The ancient Romans added blood, lard, and milk to their pozzolanic concretes, probably to improve the ease with which the concrete could be placed. Although it is unlikely that the Romans were aware of it, blood is an air-entraining agent and undoubtedly improved the durability of the Roman concretes. Little is known of concrete practice during the Dark Ages, but it is reasonable to assume that men were busy mixing various materials with concrete in an effort to improve workability and performance.

In the U. S. until relatively recent times, additions to concrete were generally regarded with suspicion because of unfortunate experiences with addition agents that had not been evaluated thoroughly. The finding that air-entrainment greatly improved the resistance of concrete to the destructive forces of freezing and thawing led to a widespread change of opinion about the merits of adding chemicals to concrete and it is now generally agreed that additions, when used with discrimination, are an essential ingredient of concrete.

Accelerators and Retarders

Practically all portland cement contains gypsum, $CaSO_4 \cdot 2H_2O$, as a retarder to bring the setting time within the limits required by A.S.T.M. and Federal Specifications. Although the setting time can be varied by making appropriate changes in the cement composition and the fineness of grinding, the demand for cements having setting characteristics different from standard cement is not generally sufficient to justify manufacturing special grades. Exceptions include "high-early" cement which is finer ground than ordinary cement and certain oil-well cements in which the chemical composition is regulated to provide extremely slow setting. Ordinarily, chemicals are added to the concrete at the mixer, when it is desired to shorten or lengthen the time over which concrete will remain workable after mixing, or to vary the rate of strength development.

The most widely used set accelerator is calcium chloride. It may be added as such to the concrete or as an ingredient in a proprietary admixture. When concreting operations must be done in the winter, calcium chloride is usually added to obtain normal strength development. Triethanolamine is used to a lesser extent as a set accelerator in ordinary concreting operations. For special applications such as sealing leaks in hydraulic structures where an extremely fast set is required, soluble silicates and fluosilicates or aluminous cements may be used. However, undesirable side effects such as poor durability, excessive heat generation, or low ultimate strength often are associated with very rapid setting.

There are many more chemicals that retard than accelerate the set of cement. Retardation is often needed in hot weather, in situations where placement of the concrete is difficult and the concrete must remain workable for long periods of time, in cementing deep oil wells, or in repairing or solidifying porous structures by pumping cement grout into fissures, cracks, and pores. Although most retarders are organic compounds, many inorganic compounds are also effective. Gypsum is, of course, the most common retarder, being present in practically all cement. Other inorganic chemicals that have been found useful include copper sulfate; sodium phosphates, particularly sodium hexametaphosphate; boron compounds such as calcium borate, borax, and boric acid; and sodium bicarbonate.

Many organic compounds also retard the set of cement. These fall into three general classes: (1) starches or cellulose products, e.g. dextrins, flours, carboxymethyl cellulose, hydroxyethyl cellulose, lignosulfonic acid and its salts; (2) sugars; and (3) hydroxy acids or their salts, e.g. tannic, gallic, tartaric, citric acids. Most of the proprietory retarding agents contain calcium liguosulfonate as the active ingredient. The humic acid in some soils retards the set sufficiently that stabilization of the soil with cement is not possible.

Improving Workability

As any "Do-It-Yourself" fan knows from hand-blistering experience, concrete is a heavy and difficult-to-move material. When concrete does not flow into corners and around reinforcing rods as easily as desired, the normal inclination even among experienced concrete workers is to add more water to the concrete. This practice posed a difficult problem for the men who design and specify concrete mixes. Generally speaking, the less water used, the better the concrete. However, chemists recently have come to the rescue of the concrete designer with a variety of chemicals that enable the working characteristics of concrete to be improved without sacrificing strength, impermeability, or durability through addition of water beyond the design limits. These chemical aids are particularly helpful where the concrete is harsh because of aggregate characteristics or grading, when the concrete must be placed around closely spaced reinforcement, in locations difficult of accessibility, or where special means of placement such as pumping are required.

The most important of the chemical agents for im-

M. Jack Snyder has participated in a variety of chemical studies at Battelle. Recently, much of his effort has been directed to research on materials utilization in the building and construction field, in reactor construction, and in special chemical processing equipment. Other studies have concerned refractories for use in jets and rockets, the preparation of colored glasses, the development of adhesives, surface chemistry and physics, and applied inorganic chemistry.

Niles Foss has been concerned with market research, product diversification, and general economic studies since his association with Battelle. These studies have related to such industrial fields as building materials, adhesives, and printing and reproduction equipment. Earlier, he had been associated with the market research department of the Dow Corning Corporation.

proving workability are sulfonated organic compounds and carbohydrate salts. Examples include salts of lignin sulfonic and naphthalene sulfonic acid, tartaric acid, citric acid, saccharic acid, and tetrahydroxy-adipic acid. Many of these chemicals also function as set retarders, and proprietory agents for improving workability often include calcium chloride or tri-ethanolamine to overcome the retarding effect.

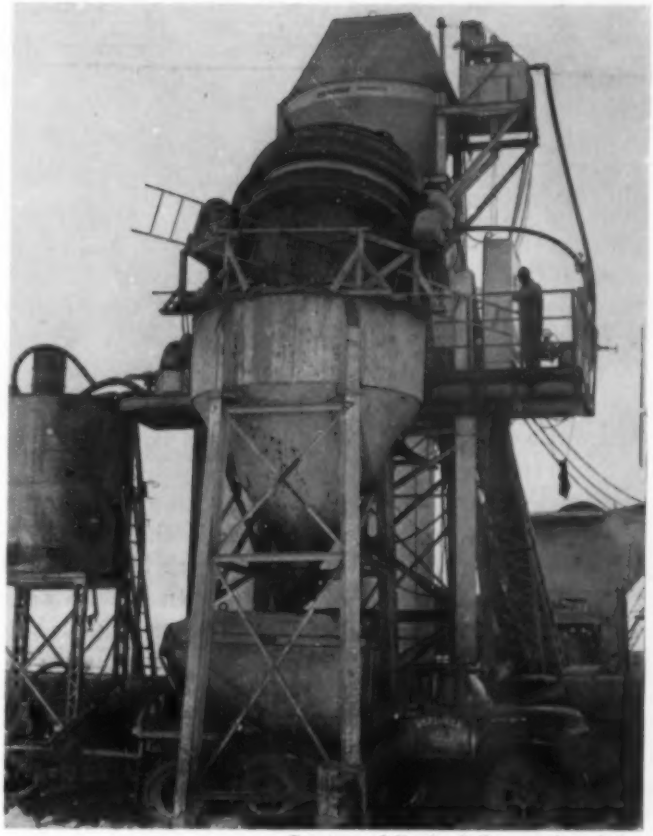
Another method of improving workability utilizes chemicals of the type that are familiar to all of us as ingredients of synthetic detergents. These chemicals result in the incorporation of small air bubbles in the concrete which serve to "lubricate" the aggregate and increase the fluidity of the concrete. Entrainment of air produces other results that are desirable for certain applications, so that the improved workability may be a bonus.

Air-Entraining Agents

The householder, who uses salt or calcium chloride to melt ice from his concrete sidewalk in winter, learns from first-hand experience how destructive ice-removing salts can be unless he is one of those few fortunate individuals whose sidewalks were made with concrete containing an air-entraining agent. The destruction of concrete highways by freezing and thawing and the added attack by ice-removing salts was at one time an extremely serious problem in northern United States. The widespread use of air-entraining agents in paving concrete within the last 15 years has almost eliminated the problem except in those few cases where the conditions are extremely severe.

Although a great variety of surface-active agents are effective air-entraining agents, for economic reason, the agents being used are confined primarily to low-priced derivatives of natural materials. Soaps of natural wood resins and fats, sulfonated oils, and neutralized tall oil are the most commonly used. In addition to their use in cast-in-place concrete such as highways, air-entraining agents have proved to be valuable in precast concrete products. Use of such agents in the manufacture of concrete block results in greater compaction and consequently denser block, improved appearance because of sharp edges and corners, and lowered absorption. The decreased breakage in green block is of great economic importance. Air-entraining agents in concrete pipe mixes result in better flow of the concrete around reinforcing, easier mold stripping, better appearance, and less permeability.

In paving concretes, the type of air-entraining agent and the quantity used is chosen carefully to provide an entrained air content of about three to six per cent by volume.



Courtesy of Portland Cement Association

A central concrete mixing plant for use on large projects. Equipped with controls for automatic operation, it produces 20 to 25 batches of concrete per hour. The batcher, to the rear of the mixer, proportions cement and aggregates which are moved to the mixer. The operator at the control panel can adjust the flow of water and regulate the addition of the air-entraining agents.

Foaming and Gassing Methods and Agents

By changing the agent, the amount used, or the mixing equipment, larger amounts of air can be entrained to produce a porous, lightweight concrete. The foaming agents used include detergent-type chemicals such as the alcohol sulfates, alkyl sulfonates, or alkyl aryl sulfonates, and derivatives of natural materials such as resin soaps, saponin, or hydrolyzed proteins. Casein, glue, starch, or hydrolyzed cellulose products often are added as stabilizing agents.

The density of ordinary concrete is about 120 pounds per cubic foot. Foamed concrete can be produced with density as low as 10-20 pounds per cubic foot. The extremely lightweight concretes have very low strengths and generally are useful only as insulating fill material. Moderately lightweight concretes (60 to 90 pounds per cubic foot) have sufficient strength for use as flooring and roof deck materials, and are finding increasing acceptance in modern build-

ing practice. The decrease in the dead-load that can be achieved with lightweight concrete provides the possibility of considerable saving in the amount of supporting steel required.

Another method of producing lightweight concrete is by incorporating a gas other than air in the concrete by means of a chemical reaction that liberates the gas within the concrete. Powdered aluminum metal is the most commonly used gassing agent. After the aluminum powder is added to the concrete and mixed for a short period, sodium hydroxide is added, followed by a final short mixing period before the concrete is cast. The aluminum powder and sodium hydroxide react to liberate hydrogen gas, whereupon the concrete expands and rises like a loaf of bread. In some cases, where lime is used as an ingredient in the mix, the sodium hydroxide is not needed. Mixtures of hydrogen peroxide and calcium hypochlorite have been used similarly to liberate oxygen as the cell-forming gas. Because of the careful control needed in producing a lightweight concrete by the gas-generation process, this method is used primarily in making precast concrete units, whereas cast-in-place cellular concrete usually is made by foaming. Research on cellular concrete products cured by high-pressure steam has demonstrated that lightweight concrete products having high strengths can be obtained in this fashion. Commercialization of the laboratory findings undoubtedly will open still wider markets for lightweight concrete and the chemicals used in producing it.

Waterproofing

Many arguments have raged over the subject of waterproofing concrete. Much of the argument has been due to semantic difficulties about the term "waterproofing". Water passes through concrete by two different processes. In one, water under pressure is forced through either relatively large or small channels connecting the inner and outer faces of the concrete—the cause of most leaky basement walls after a heavy rain. In the second process, water passes through the concrete by action of capillary forces in the absence of any appreciable water pressure. This process can result in a damp basement by transfer of moisture from earth in contact with the outside surface, even though the wall is free from cracks and shows no visible signs of leaking.

To avoid the confusion inherent in using the term waterproofing, more precise terminology has been adopted generally. Prevention of moisture transfer by flow under pressure through channels within the concrete is referred to as "permeability reduction". Prevention of capillary transfer of moisture is called "damp proofing".

Many concrete technologists assert that a properly designed mix, placed and cured according to specifications, is completely impermeable to water and is in no need of a permeability reducing addition. Others assert that concrete is not always designed, placed, and cured properly and that water-reducing additions will help insure a dense, impermeable concrete. It is generally agreed that addition of many oils, fats, metallic soaps, asphalt emulsions, or certain silicones to concrete make it initially water-repellant and retard capillary transmission of moisture. There is some disagreement, however, as to the permanancy of the damp proofing thus obtained.

The major use of damp-proofing additions has been in masonry mortars and in cement-base paints for application over the interiors of concrete foundations and as an exterior coating over various kinds of masonry construction. Calcium stearate is the most common addition as it can be readily added by the cement manufacturers or by a compounder of cement-base paints. Recently, a dry silicone powder has been offered for this application. Liquid materials such as asphalt emulsions or butyl stearate emulsions have the disadvantage that they must be packaged separately and be added as a separate ingredient by the consumer.

Reducing Brittleness

The major deficiency of concrete as a construction material is that it is brittle. It is lacking in resiliency and extensibility, and has low tensile strength. An obvious approach to remedy this deficiency is to incorporate a plastic or rubbery material in the concrete. Asphalt emulsions, polyvinyl acetate emulsions, and rubber latex emulsions have been added to concrete for this purpose. Although laboratory tests have shown that such additions do improve the resiliency, increase the tensile strength and the elongation on tensile stressing, increase resistance to cracking, and in many situations improve the chemical resistance of concrete, few data are available on the performance in actual service.

The major drawback to extensive use of plastic and rubber emulsions in concrete is their cost. With cement selling for about one cent per pound and aggregate selling for even less, it is not economically practical to add much of a material costing 30 to 50 cents per pound to concrete. In some applications, the advantages to be gained by the addition of plastics or rubber to concrete may balance the increased cost. Thus, some use is being made of the materials in floor topping mixes, tank linings, patching mixes, mortars, and stucco. If these special mixes live up to their predicted performance, the market will increase appreciably.

Fungicidal Additions

Deterioration of concrete floors is a recurring problem in food-processing plants, dairies, and breweries. The primary cause of such deterioration appears to be bacterial or fungus attack on spilled materials resulting in acidic products that weaken or dissolve the cement. Several chemicals have been added to cement and concrete in an attempt to inhibit the growth of bacteria and fungi. Copper compounds such as copper oxychloride, copper acetoarsenate, and copper oxides, and fungicidal organic compounds such as pentachlorophenol have been found effective in the laboratory. Limited service experience indicates that such additions are effective in actual practice. In addition to their use in food-processing plants, fungicidal or antibacterial concretes have been used in shower-room floors, gymnasium floors, locker-room floors, swimming pools, cafeteria floors, and hospital floors. The problems of slime and fungus growth in piping and fluid transmission lines, particularly in the paper and textile industries, offer a potential outlet for such concretes.

Chemicals on Concrete

The treatment of concrete objects with chemicals for any purpose other than a purely decorative one is a relatively recent development. The aim in chemically treating a concrete surface ordinarily is to improve its resistance to some agent or force. A notable exception to this generalization is the use of chemicals on fresh concrete as a curing aid.

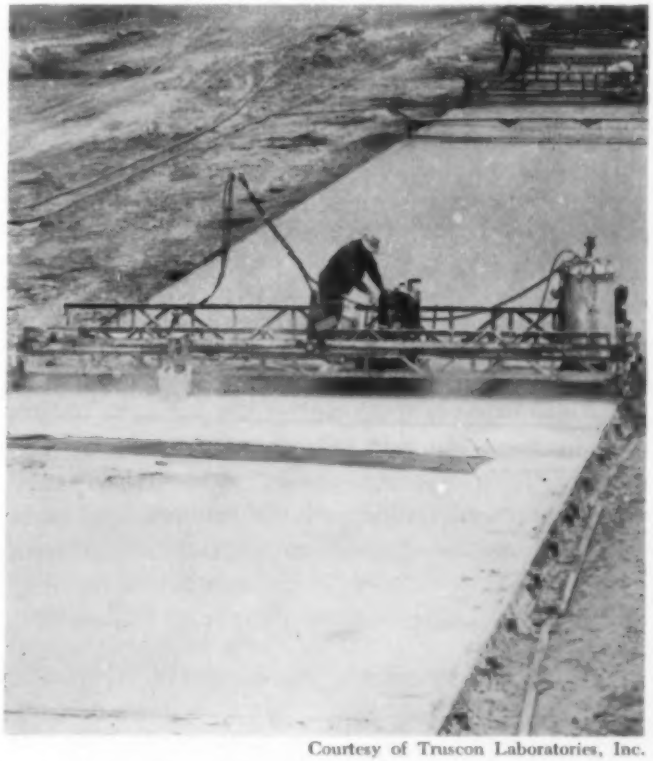
Curing Compounds

The reaction by which concrete hardens and develops strength is hydration, and sufficient water must be provided to insure that the reaction goes to completion. The amount of water which must be added to cement and aggregate to make a workable concrete, even with a water-reducing agent present, is well above the minimum amount required for hydration. The only problem then is to keep the water within the concrete where it is available for reaction. The time-honored method of maintaining the water content at the required level is to replace the water lost by evaporation by spraying or ponding water over the concrete or covering it with moist burlap, straw, sand, or earth. For best results, the concrete should be kept moist in this way for several days. Because of the high labor costs associated with the conventional wet-curing methods and the ever present risk that someone will forget to water the concrete, an easier, cheaper, "one-shot" curing method is desirable.

One of the earliest chemical methods of curing concrete was to sprinkle calcium chloride over the fresh concrete, the theory being that the calcium chloride would absorb moisture from the air and thereby keep the concrete moist. This method proved to be unreliable as the calcium chloride absorbed moisture from the concrete, particularly in dry weather, and often defeated the very purpose for which it was used.

In the late 1920's, a new curing process was developed that involved depositing a waxy or resinous film on the fresh concrete. The materials used in this process came to be known as membrane curing compounds. Until World War II, little use was made of this development, but the need for simple methods of insuring ample curing of concrete in military airfields at that time led to extensive use of membrane curing. It is now widely used on military airfields, highways, irrigation canals, and is beginning to be adopted in building construction.

Membrane curing compounds may have a wax base, a resin base, a mixture of wax and resin, or an asphalt base. Paraffin, petrolatum, and microcrystalline waxes are used. Cumar and terpene resins are the most commonly used resins in the resin-base membranes. Membrane curing compounds are supplied both in clear form or in pigmented form. The pigmented form usually is preferred because of its ability to reflect sunlight and thereby keep the concrete cool and help



Courtesy of Truscon Laboratories, Inc.

The equipment in the foreground is a modern, self-propelled, automatic sprayer for applying a membrane curing compound on freshly-laid concrete pavement. The compound, contained in the tank on the right, is sprayed under pressure through moving nozzles. The concrete in the foreground is newly sprayed.

retard evaporation of moisture further. Asphalt-based curing compounds have the disadvantage of absorbing heat and are used primarily where sun reflection is not of vital concern.

Polyethylene sheet has come into prominence recently for curing concrete. It has the advantage of extremely low permeability to water, but its higher price and the labor cost in applying it are deterrents to widespread acceptance.

Surface Sealers

Concrete floors often dust slightly so that they are difficult to keep clean and the dust is tracked into areas where white footprints are not regarded with favor. Surface sealing compounds have been developed to harden the surface and form a nondusting, impervious layer on the concrete floor. Sodium silicate solution was one of the earliest surface sealers. Solutions of fluoride salts or salts of fluosilicic acid, particularly the sodium and magnesium salts, are often used. Many proprietary surface sealers are combinations of sodium silicate and a fluoride or fluosilicate. Linseed oil or varnishes are used to obtain the same end result without involving a chemical reaction with the concrete.

The chemically reactive surface sealers have also been used to obtain a more acid resistant concrete surface. When portland cement sets, hydrated lime, $Ca(OH)_2$, is formed as a reaction product; the $Ca(OH)_2$ is readily soluble in acids and is the primary cause of the low acid resistance of concrete. By treating a concrete object with various salts, such as fluorides for example, the $Ca(OH)_2$ can be converted to an acid-insoluble salt and the acid resistance of the concrete is increased. Treatment with a silicofluoride salt results in the formation of a bulky precipitate that fills or occludes the pores of the concrete, thereby retarding entry of acids or other aggressive chemicals into the concrete. A recent development known as "ocration" involves treatment of dry concrete objects with hydrogen fluoride, silicon tetrafluoride, or mixtures of the two in the gaseous state. It is claimed that greater penetration into the concrete and more positive protection against acid attack results from treatment in this manner. There are obvious handling difficulties in the practical application of this method, however.

Chemicals, Concrete, and the Future

The rapid growth in the use of concrete, combined with the greater use of chemicals with concrete, indicates new opportunities in the concrete market for the aggressive chemical producer.

The quantity of chemicals used for the surface treatment of concrete is difficult to estimate because of the variety of chemicals used and the difference in price. However, based on the best information available, there is probably a present eight million gallon market for surface applied chemicals of all kinds valued at some seven million dollars. Primarily due to the accelerated road building program, this market is expected to at least double during the next five years.

Although the amount of a chemical added to a cubic yard of concrete may be a very small quantity, when this amount is multiplied by the total cubic yards of concrete produced in a year, an impressive figure is obtained. Although at present only a negligible amount of concrete is produced with chemical additions in amounts greater than one per cent of the cement (with the exception of $CaCl_2$ accelerator), the demand for these special concretes is growing and may ultimately represent an appreciable outlet for chemical products.

Additional developments undoubtedly will come out of the research laboratories to provide future opportunities for chemical additions to concrete. Chemicals that would enable the attainment of the ultimate strength of concrete in much shorter curing periods than are now possible would be a distinct advantage in practically every application of concrete. Studies now in progress on air-entrainment may lead to the development of more effective air-entraining agents that are less susceptible to variability caused by unavoidable variations in the cement, aggregates, and water used in making concrete. Chemical additions that would prevent the shrinkage of cement mortars and grouts, and that would improve their bonding power would be a boon to the masonry and tile industries. Improvement of the chemical resistance of concrete by chemical additions would lead to additional applications of concrete where more costly materials now are used and would result in a substantial reduction in the maintenance costs in many applications where concrete has a limited life because of chemical attack.

"Man, being the servant and interpreter of Nature, can do and understand so much and so much only as he has observed in fact or in thought of the course of nature: beyond this he either knows anything nor can do anything."

Francis Bacon in *Novum Organum*

NOTES from BATTELLE

GAMMA RAY DOSIMETRY

Many materials undergo changes, such as in color, when they are exposed to gamma radiation. When these changes are relatively easily measured, and when they are mathematically related to the total amount of radiation received, the materials involved may be used in gamma dosimeters, that is, dose-measuring devices that can indicate the total amount of gamma radiation received by objects near the dosimeter.

Battelle is evaluating effects of gamma radiation on various materials as a basis for their possible usefulness as gamma ray dosimeters. The study is being conducted for the Wright Air Development Center.

One of the major contemplated uses of such effects would be in dosimeters used for experimentation involving the effects of gamma radiation on various materials and components. In such studies it is necessary to know the total radiation dosage to which a system is being subjected.

According to Battelle technologists Paul Schall, Jr. and G. D. Calkins who are guiding the study, the objective of the research program is the investigation of those effects of gamma radiation that can serve as methods for measuring high radiation doses. Major target properties of the dosimetric device to be developed include:

- A service range of doses from one-hundred-thousand to ten-billion roentgens, the latter 10,000 times larger than can be measured directly by available dosimeters.
- Independence from the effects of temperature from —55 to 500 C.
- Insensitivity to neutrons.
- Reproducibility of measurements to within three per cent.
- Small size (1½-inch maximum diameter and 3-inch maximum length).

Involved in this study will be a survey of existing dosimetric methods; investigation of other radiation-induced phenomena that may serve as gamma dosimeters; and investigation of phenomena that are sensitive to the energy level of gamma radiation and may be used to determine the form of the energy spectrum of the radiation.

BURNER RESEARCH

Basic studies directed toward developing optimum design characteristics for burners for field heating stoves have been started at Battelle under the sponsorship of the U. S. Army Quartermaster Research and Development Center, Natick, Massachusetts.

Objectives of the investigation are creation of design specifications for a group of natural draft, gravity feed, vaporizing, puddling-type burners having heat outputs ranging from 15,000 to 60,000 Btu's per hour. These burners are to be capable of safely burning combat (leaded) gasoline as well as diesel and fuel oil.

Stoves utilizing burners of this type are provided by the Quartermaster Corps for field heating of tents and other shelters. As a result of the research at Battelle, it is hoped to minimize the hazards involved in the combustion of gasoline. Some of the hazards are due to flame failure caused by natural or created downdraft, improper refueling, temporary stoppage of fuel flow, and flooding, to cite a few.

Characteristics desired in the burners are: portability, ability to operate under a wide range of conditions, quiet operation, and sufficient heat release. In addition, they should be inexpensive and not require critical materials.

HIGH-TEMPERATURE BEARINGS

To obtain design data and information on modes of failure for rolling-contact bearings operating at temperatures ranging from 300 F to 600 F, Battelle has started a program of research for the Wright Air Development Center.

Increasing temperature demands on airframe bearings in high-speed aircraft and guided missiles have pushed bearing requirements beyond the range of current design information. "Data are practically nonexistent for heavily loaded oscillating bearings in the 300 F to 1200 F range," according to Battelle technologist C. M. Allen, "and bearings and lubricants for airframe applications are not known which can be operated beyond 1200 F."

The present investigation at Battelle is the first phase of a three-part program that has the ultimate

objective of developing new bearings and lubricants and adequate design data for bearings to operate at these higher temperatures.

An evaluation of currently available bearings to obtain design data and information on modes of failure in the temperature range of 300 to 600 F constitutes the first phase. It will include a survey of a number of bearing producers and users to aid in determining some of the limitations and problems involved in the use of airframe antifriction bearings. As many as 1500 bearings may be evaluated in load-life experiments for the development of design data. In both the survey and the experimentation, a prime objective of this research for the Air Force will be to develop load-life and an increased understanding of the mechanism of failure at moderately high temperatures.

The mechanism of failure at elevated temperatures is not known except that above a certain temperature level, depending upon the material, surface fatigue may not be the dominating mode of failure. Rather the failure, Allen says, might progress as a result of creep or plastic flow and wear.

* PLATING FOR ZINC DIE CASTINGS

Reduction of process costs is a primary aim of much of today's research. In the making of zinc die castings, one of the points at which costs may be reduced appears to be in improving the finishing and electroplating processes. An investigation, now under way at Battelle for the American Zinc Institute, is aimed at eliminating the costly step of hand buffing. Buffing is currently necessary to provide the mirrorlike appearance demanded by American industries and their customers.

New methods for electropolishing and bright zinc plating are being investigated in order to eliminate buffing. Electropolishing smoothens irregularities on the surface at the edges, and where flash has been trimmed, and it also rounds off pore edges, which is useful in the zinc plating operation that follows. The plating operation seals surface porosity and overcomes surface roughness, providing a smooth, mirrorlike surface. The sealing of the pores is expected to give castings improved corrosion resistance when they are subsequently plated with copper, nickel, and chromium by conventional methods. Because of its leveling power and excellent finish, the process also will be of interest to manufacturers for preserving steel parts that conventional plate fails to make adequately smooth.

The advantages that are seen resulting from the above finishing process include:

(1) Saving of time, since once racked for electropolishing, the castings can be processed with automatic plating equipment through the remaining steps, without rehandling.
(2) Elimination of costly hand-buffing.
(3) Simplification of the disposal of chemical wastes because cyanide and other dangerous chemicals are not used and because neutralization of rinse waters from the alkaline electropolishing and acid plating solutions is obtained by mixing them.

* MANUALS ON DATA PRESENTATION

Even in these days of mass communication, there still are many situations requiring effective communications to small groups. A wide variety of equipment is manufactured for use in such activities; however, because information about such equipment is spread over the sales literature of many companies, the would-be communicator frequently does not make best use of available aids.

To improve and to speed up such presentations to small groups, the Rome Air Development Center commissioned Battelle to prepare two manuals to help those with communication and briefing problems.

Volume I, *Audio-Visual Presentation of Intelligence Data* is a compilation of techniques and equipment useful in the presentation of information. Part I of this volume is a discussion of such points as principles of briefing; preparation of graphic materials for visual presentation; physical arrangements of the briefing room; and the techniques of presentation by still projectors, 16-mm sound projectors, television, and stereoscopy. Part II is an illustrated catalogue of equipment that may be used for such presentation.

Volume II, *Graphical Processing of Intelligence Data* is an equally comprehensive description of methods of copying and reproducing materials in short runs, up to 100 copies. Part I of the volume describes types of reproduction processes and equipment and gives directions for operating them. Illustrations help to explain the mechanical nature and operation of the various kinds of equipment. Included are equipment for composition and for preparing copy; microreproduction; silver halide, electrostatic, electronic, thermal, blueprinting, diazotype, chemical, stencil, and offset processes; and three-color processes. Part II is a catalogue covering related equipment and materials.

The two volumes will be available from the Office of Technical Services, Department of Commerce, Washington 25, D. C.

Writings by STAFF Members

Ductile Chromium and Its Alloys, American Society for Metals, 1957, contains the following writings by staff members:

The Mechanical Properties of Swaged Iodide-Base Chromium and Chromium Alloys. D. J. Maykuth and R. I. Jaffee, pp. 247-254.

The modulus of elasticity of Cr is 42,000,000 psi. at room temperature, which decreases to 36,000,000 psi. at 800 C. The swaged and recrystallized Cr-base alloys with fifty per cent Fe or Ni tested as bar stock, have excellent tensile ductility, but tensile ductility is low in an alloy with 40 per cent Fe and is lost completely at 40 per cent Ni.

Influence of Chromium Metal Purity on the Properties of Chromium Metal Alloys. D. J. Maykuth and R. I. Jaffee, pp. 229-246.

Alloys of Cr with Ta, V, Mo, W, Cb, Fe, Ni, and Co were investigated, only the last three showing a significant range of workable compositions. The Cr-rich Cr-Ni alloys show better combinations of strength and ductility than the other alloys tested. Oxygen, S, and N in commercial grade Cr have a detrimental effect on Cr-Fe and Cr-Ni alloys, particularly in a 61 per cent Cr-39 per cent Fe alloy where these contaminants produce both hot shortness and brittleness in room-temperature bending.

A Forgeable Chromium-Iron Alloy. D. P. Moon, H. A. Blank, and A. M. Hall, pp. 314-321.

Alloys of the composition 70 Cr, 30 Fe, 9 Mo, 2 to 3 Ti, and up to 0.5 Al (parts by wt.) have excellent high-temperature strength, and are forgeable in ingot sizes up to 12 lb. They do not show measurable ductility in room-temperature tests, but are malleable at room temperature, and show excellent resistance to thermal shock.

Properties of Iodide Chromium. R. J. Runck, T. E. Fearnside, J. M. Blocher, and I. E. Campbell, pp. 129-137.

Purity seems to be the most important single factor affecting properties. High-purity metal is best obtained by thermal dissociation of the iodide, but the problem of contamination in fabrication is yet to be solved.

Development of Magnesia-Loaded Nitrile Rubber Composition for High-Temperature Oil Resistance. R. A. Clark and W. H. Gillen. *Rubber World,* May 1957, pp. 220-231.

In an effort to develop a nitrile rubber compound to meet certain minimum physical properties after 500 hr. immersion in a synthetic diester lubricant at 350 F, a magnesia-loaded compound was developed that withstood the severe aging conditions for 168 hrs. Extensive compounding studies with curing systems, antioxidants, plasticizers, softeners, and other materials failed to improve the aging characteristics.

Tin Is Not a Subversive Element in Gray Iron. J. A. Davis, D. E. Krause, and H. W. Lownie, Jr. *Modern Castings,* May 1957, pp. 96-98.

Additions of Sn act as a powerful stabilizer of pearlite, promoting wear resistance and machinability. The amount used is governed by the amount of ferrite in the base iron.

Improved Ductility in Titanium Welds. M. L. Kohn, G. E. Faulkner, and G. W. Bauer. *Metal Progress,* April 1957, pp. 82-86.

The commercial alpha-beta alloy with six per cent Al and four per cent V has deficient bend ductility when welded with filler metal of the same composition but much better ductility when welded with unalloyed titanium as filler metal, especially after a long anneal in the alpha-beta phase region.

Stability Limits of Flames of Ternary Hydrocarbon Mixtures. P. F. Kurz. *Combustion and Flame,* March 1957, pp. 3-13.

Studies of lean blow-off and flash-back limits of laminar flames of ternary hydrocarbon mixtures containing ethylene show that these stability limits of the mixtures are predictable. At rich blow-off, there is evidence of inhibition in mixtures where the ethylene concentration exceeds a certain minimum as a secondary fuel.

Evaluation of Weld-Joint Flaws as Reinitiating Points of Brittle Fracture. D. C. Martin, R. S. Ryan, and P. J. Rieppel. *Welding Journal,* v. 36, May 1957, pp. 244s-251s.

Influence of various types and sizes of flaws in welded butt joints on the initiation of brittle fractures were studied under conditions closely simulating those found in service. It was found that brittle fractures initiate from weld defects in laboratory specimens under conditions similar to the reported conditions involved in some service failures of ships.

The Performance of Some Soft Solders at Elevated Temperatures and Pressures. H. E. Pattee and R. M. Evans, Paper from "Symposium on Solder. ASTM Special Technical Publication No. 189", American Society for Testing Materials. 1957. pp. 103-114.

Tests under cyclic loads at 257 F indicated the superiority of high-tin solders. Small additions of Mn, Cr, Fe, Ni, Ge, and Ce improved performance of a 70 Sn - 30 Pb solder, but only the latter three were beneficial in a 30 Sn - 70 Pb solder.

Ladle Brick and Casting Pit Material. **Pfannensteine und Giessgrubenmaterial.** Rudolf Rasch. *Sprechsaal,* v. 90, January 1957, pp. 43-47.

Surveys composition, preparation, properties, and applications of these refractories, and describes effects of charge composition and other factors on service life. Evaluates properties of various bodies in terms of phases in the FeO-MnO-SiO_2, FeO-MnO-Al_2O_3, and CaO-SiO_2-Al_2O_3 systems.

Researches on Crystal Orientation in Cold Rolled Recrystallized Iron Sheets, with Regard to Iron Carbonyl. **Richerche Sull'-orientamento Cristallino in Lamiere Di Ferro Laminate a Preddo e Ricristallizzate, con Riguardo al Ferro Carbonile.** H. Weik. *Metallurgia Italiana,* v. 48, November 1956, pp. 495-502.

Describes the preparatory treatment given to samples, and then compares the crystal orientation at various stages of processing. Discusses methods for the elimination of undesirable crystal orientations.

Graphic Arts Research. J. Homer Winkler. *Photoengravers Bulletin,* v. 46, February 1957, pp. 13-20.

After reviewing trends in United States total research effort and research in the graphic arts industry, concludes that research expenditures are not in keeping with the industry's sales volume. Indicates examples where past research investments have paid off generously and dramatically. Points out need for increased research and areas where effort could profitably be applied.

Members of the Battelle staff are authors of the recently published articles and books listed on this page. In most cases, reprints are available from the Battelle Publications Office, 505 King Avenue, Columbus 1, Ohio.

WORLD-WIDE ABSTRACTS

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499a Miscellaneous

BATTELLE Technical Review ABSTRACTS

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***Asterisks mark items that may be used in the Battelle Library only. None of the unbound materials listed below are available for interlibrary loan.**

AERONAUTICAL ENGINEERING

9400 Some Experiments Related to the Noise From Boundary Layers. Harvey H. Hubbard. *Acoustical Society of America, Journal,* v. 29, Mar. 1957, p. 331-334.

Experimental data relating to the inside noise of a body such as a fuselage, the fluctuating surface pressures due to localized disturbances on the body, and the noise radiated into free space from various rotating aerodynamic surfaces.

9401 The Optimum Design of Long-Range Aircraft. Karl L. Sanders. *Aircraft Engineering,* v. 29, Apr. 1957, p. 98-106.

An examination of the best values of aspect ratio, wing loading, and fuel-load ratio for different conditions.

9402 Perturbations of a Body in an Exponential Atmosphere. H. G. Cuming. *Aircraft Engineering,* v. 29, Apr. 1957, p. 123-124.

An analytic solution to the second order linear differential equation whose coefficients vary exponentially with time.

9403* Guided Missiles and Rockets. A Bibliography, 1946-1956. 50 p. 1956. Engineer School Library, Fort Belvoir, Va. (ZUG630 Un3.24g Ref.)

Includes references to all major aspects of the guided missile and rocket programs.

9404 Recent Developments in the Method of the Rheoelectric Analogy Applied to Aerodynamics. Lucien C. Malavard. *Journal of the Aeronautical Sciences,* v. 24, May 1957, p. 321-331.

Application of the method to direct plotting of the constant velocity lines of plane flow fields, analog calculation of the aerodynamic characteristics of a wing subjected to blowing at the trailing edge, and analog calculation of the annular wing.

9405 The Balance Method Applied to Swept-Wing Stress Analysis. Luigi Broglio. *Journal of the Aeronautical Sciences,* v. 24, May 1957, p. 363-370.

9406 Correlation of Cone-Cylinder Normal Force and Pitching Moment Data by the Hypersonic Similarity Rule. William H. Dorrance and Robert G. Norell. *Journal of the Aeronautical Sciences,* v. 24, May 1957, p. 371 + 7 pages.

9407 High Speed Systems of Wind Tunnel Data Handling. J. Lukasiewicz, J. A. van der Bliek, and J. G. Scott. *North Atlantic Research and Development Report* 17, Feb. 1956, 24 p. (TL565 Ag11r Contin.)

Describes force and pressure data handling systems, which consist of commercially available components.

9408 Measurement of the Aerodynamic Forces on Oscillating Aerofoils. W. G. Molyneux. *North Atlantic Treaty Organization, Advisory Group for Aeronautical Research and Development Report* 35, Apr. 1956, 39 p. (TL565 Ag11r Contin.)

Provides a basis for comparison of the various force-measuring techniques and for determining the particular technique most likely to meet requirements.

9409 Optical Problems of the Satellite. R. Tousey. *Optical Society of America, Journal,* v. 47, Apr. 1957, p. 261-267.

Some problems of the artificial earth satellite include visibility, photographic determination of the precise orbit, and the temperature that the satellite will reach through radiation exchange.

9410 Wing Section Design for Swept-Back Wings at Transonic Speeds. A. B. Haines. *Royal Aeronautical Society, Journal,* v. 61, Apr. 1957, p. 238-244.

9411 Solution of Aeroelastic Problems by Means of Influence Coefficients. D. Williams. *Royal Aeronautical Society, Journal,* v. 61, Apr. 1957, p. 247-251.

With a set of "elastic" influence coefficients giving the deformation of the structure under any given set of loads and a set of aerodynamic influence coefficients giving for any stipulated deformation of the structure the set of aerodynamic loads induced by such deformation, all "static" aeroelastic problems can be solved using a digital computer.

9412 Incompressible Flutter Characteristics of Representative Aircraft Wings. C. H. Wilts. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3780, Apr. 1957, 121 p. (TL570 Un3t)

The results of a detailed study of the flutter characteristics of four wings using the electric analog computer.

9413 Effect of an Interface on Transient Temperature Distribution in Composite Aircraft Joints. Martin E. Barzelay and George F. Holloway. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3824, Apr. 1957, 51 p. (TL570 Un3t)

The presence of an interface was found in simulated conditions to have a significant effect on the temperature distribution in all geometries tested.

9414 Investigation of the Effects of Leading-Edge Chord-Extensions and Fences in Combination With Leading-Edge Flaps on the Aerodynamic Characteristics at Mach Numbers From 0.40 to 0.93 of a 45° Sweptback Wing of Aspect Ratio 4. Kenneth P. Spreemann and William J. Alford, Jr. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3845, Apr. 1957, 45 p. (TL570 Un3t)

Lift, drag, and pitching moment were obtained for all configurations over an angle-of-attack range of about −2 to + 24°.

9415 An Experimental Hydrodynamic Investigation of the Inception of Vortex Ventilation. John A. Ramsen. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3903, Apr. 1957, 31 p. (TL570 Un3t)

Studies on three modified flat plates of aspect ratio of 0.25 differing in scale and thickness ratio.

9416 The Response of an Airplane to Random Atmospheric Disturbances. Franklin W. Diederich. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3910, Apr. 1957, 95 p. (TL570 Un3t)

9417 A Collection of Data for Zero-Lift Damping in Roll of Wing-Body Combinations as Determined With Rocket-Powered Models Equipped With Roll-Torque Nozzles. David G. Stone. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3955, Apr. 1957, 23 p. (TL570 Un3t)

9418 Analysis of Static Aeroelastic Behavior of Low-Aspect-Ratio Rectangular Wings. John M. Hedgepeth and Paul G. Waner, Jr. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3958, Apr. 1957, 21 p. (TL570 Un3t)

Slender-body theory is used in conjunction with plate theory to analyze the static aeroelastic-divergence behavior of low-aspect-ratio rectangular wings of constant thickness when chordwise deformations are considered.

9419 Effects of Fuselage Nose Length and a Canopy on the Static Longitudinal and Lateral Stability Characteristics of 45° Sweptback Airplane Models Having Fuselages With Square Cross Sections. Byron M. Jaquet and H. S. Fletcher. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3961, Apr. 1957, 47 p. (TL570 Un3t)

9420 The Linearized Subsonic Flow About Symmetrical Nonlifting Wing-Body Combinations. John B. McDevitt. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3964, Apr. 1957, 67 p. (TL570 Un3t)

9421 Exploratory Study of Ground Proximity Effects on Thrust of Annular and Circular Nozzles. Uwe H. von Glahn. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3982, Apr. 1957, 48 p. (TL570 Un3t)

The proximity of the ground to an annular nozzle can result in thrust augmentation of up to 50%. The magnitude of thrust augmentation is a function of ground-to-nozzle distance, and nozzle configuration and pressure ratio.

9422 A Note on the Effect of Heat Transfer on Peak Pressure Rise Associated With Separation of Turbulent Boundary Layer on a Body of Revolution (NACA RM-10) at a Mach Number of 1.61. K. R. Czarnecki and Archibald R. Sinclair. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3997, Apr. 1957, 13 p. (TL570 Un3t)

Tests indicated little or no effect of heat transfer on the peak pressure rise required for separation.

9423 Experimentally Determined Natural Vibration Modes of Some Cantilever-Wing Flutter Models by Using an Acceleration Method. Perry W. Hanson and W. J. Tuovila. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4010, Apr. 1957, 46 p. (TL570 Un3t)

Three-dimensional views are presented of the first three natural vibration mode shapes of ten cantilever-wing models. A table of normalized deflections at six spanwise and five chordwise stations is included for each mode.

See also: **10468** (metals for high-speed flight); **10687** (cockpit design).

AGRICULTURE

9424* Ability of Plants to Absorb Phosphate From Soil. R. Scott Russell. *Agricultural Review*, v. 11, Apr. 1957, p. 10-19.

A new approach to understanding the phosphate nutrition of plants was made possible by radioactive tracers.

9425 Conditioning of Agricultural Soils With Fatty Acid Still Pitch. R. F. Paschke, Robert Nordgren, and D. H. Wheeler. *American Oil Chemists' Society, Journal*, v. 34, Apr. 1957, p. 149-151.

Still pitch remaining after the commercial distillation of soy and cottonseed oil fatty acids may be an effective agent for improving the tilth of certain agricultural soils. It greatly increases the water-holding capacity.

9426 Fertilizers. J. A. Brabson. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 2, p. 643-647.

Review of outstanding recently developed analytical methods.

9427 Pesticides. W. E. Westlake. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 2, p. 679-683.

A selective and critical review of literature published from Nov. 1954 through Oct. 1956 concerning chemical analysis of chlorinated hydrocarbons, organic phosphorus compounds, pyrethrum and allethrin, pyrethrum synergists, herbicides, fungicides, and rodenticides.

9428* Changes in Organic Matter and pH in a Podzolic Soil as Influenced by Subterranean Clover and Superphosphate. C. H. Williams and C. M. Donald. *Australian Journal of Agricultural Research*, v. 8, Mar. 1957, p. 179-189.

Soil organic matter had approximately constant proportions of C, N, S, and P in the ratio 155:10:1.4:0.68. Rate of build-up of soil organic matter under the clover pastures may have been limited by the amounts of S supplied in the superphosphate top-dressings.

9429* The Movement of Cobalt and Zinc in Soils as Indicated by Radioactive Isotopes. C. B. Jones, D. S. Riceman, and J. O. McKenzie. *Australian Journal of Agricultural Research*, v. 8, Mar. 1957, p. 190-201.

9430* An Application of Stochastic Processes to Experimental Studies on Flour Beetles. Chin Long Chiang. *Biometrics*, v. 13, Mar. 1957, p. 79-97.

Studies of insect population growth.

9431 Photoperiodic Responses in Seedlings of Northern Tree Species. O. Vaartaja. *Canadian Journal of Botany*, v. 35, Mar. 1957, p. 133-138 + 1 plate.

Under conditions simulating long photoperiods, the seedlings of all tested species grew well and continued their growth during the eight month experimental period. Under the short photoperiod responses varied from almost none to an abnormally early dormancy.

9432 The Deterioration by Fungi of Jack, Red, and White Pine Killed by Fire in Ontario. J. T. Basham. *Canadian Journal of Botany*, v. 35, Mar. 1957, p. 155-172 + 3 plates.

9433* Bacteria in Clover Root Tissue. M. N. Philipson and I. D. Blair. *Canadian Journal of Microbiology*, v. 3, Suppl., Mar. 1957, p. 125-129.

Detection of bacteria other than *Rhizobium* in nodule cultures led to studies on bacteria existing within normal clover roots.

9434* Effect of a Soil Microflora Selected by Carbon Disulphide Fumigation on Survival of *Armillaria Mellea* in Woody Host Tissues. S. D. Garrett. *Canadian Journal of Microbiology*, v. 3, Suppl., Mar. 1957, p. 135-149.

9435* Nutrition of a Cobalamin-Requiring Soil Bacterium. Milton K. Goldberg, S. H. Hutner, and J. E. Ford. *Canadian Journal of Microbiology*, v. 3, Suppl., Mar. 1957, p. 329-334 + 1 plate.

The pattern of the vitamin B_{12} requirement of a soil bacterium "Lochhead 38" resembled that of the protozoan *Ochromonas malhamensis* and of higher animals.

9436* Nitrogen Losses During Nitrification in Solutions and in Acid Sandy Soils. F. C. Gerretsen and H. de. Hoop. *Canadian Journal of Microbiology*, v. 3, Suppl., Mar. 1957, p. 359-380.

9437* Uptake of Ions and Metallic Chelation in Plants. T. S. Sadasivan. *Indian Academy of Sciences, Proceedings*, v. 45, sec. B, Jan. 1957, p. 1-8.

A brief review of literature on the subject.

9438 Rates of Solution of Calcium Phosphates in Phosphoric Acid Solutions. E. O. Huffman, W. E. Cate, M. E. Deming, and Kelly L. Elmore. *Journal of Agricultural and Food Chemistry*, v. 5, Apr. 1957, p. 266-275.

Information about the complex chemistry of phosphate in soil systems was obtained from measurements of the rates of solution of eight synthetic calcium phosphates and three natural fluorapatites in dilute solutions of H_3PO_4. Rates of solution vary inversely with the pH of the solvent.

9439 Response of Alfalfa to Applications of a Soluble Borate and a Slightly Soluble Borosilicate Glass. E. R. Holden and A. J. Engel. *Journal of Agricultural and Food Chemistry*, v. 5, Apr. 1957, p. 275-279.

9440* Uptake of Nitrogen and Calcium by Fertilized Shortleaf Pine. Elmer R. Roth and Otis L. Copeland. *Journal of Forestry*, v. 55, Apr. 1957, p. 281-284.

Both healthy and littleleaf-diseased shortleaf pines readily take up the N from $NaNO_3$, $(NH_4)_2SO_4$ or "Milorganite" added to the soil, as determined by the increased N content of the foliage. Addition of Ca produced no improvement of littleleaf symptoms.

9441 Soil Fumigation. IV. Sorption of Ethylene Dibromide on Soils at Field Capacity. V. Diffusion of Ethylene Dibromide Through Soils. F. Call. *Journal of the Science of Food and Agriculture*, v. 8, Mar. 1957, p. 137-150.

9442 Investigations on Soil Nitrogen. I. The Influence of Nitrogen Fertilizers and Rainfall on Soil Nitrate Concentrations. G. W. Cooke, J. A. R. Bates, and P. B. Tinker. *Journal of the Science of Food and Agriculture*, v. 8, Apr. 1957, p. 248-252.

9443* The Rise of Sap in a Tropical Liana. P. F. Scholander, Berthe Ruud, and Helge Leivestad. *Plant Physiology*, v. 32, Jan. 1957, p. 1-6.

Air breaks in the vessels and tracheids produced by various cuts stay confined in the severed units, and the transpiration stream simply moves around these obstacles in the intact units.

9444* Studies on the Growth of Citrus Seedlings With Different Forms of Nitrogen in Solution Cultures. Paul F. Smith. *Plant Physiology*, v. 32, Jan. 1957, p. 11-15.

Freshly emerged pineapple sweet orange seedlings were successfully grown in aerated solutions with N supplied as $(NH_4)_2SO_4$. Such plants were healthy and essentially equal to others grown with all or part of their N supply from NO_3 provided the development of excess acidity was prevented. Somewhat greater root development occurred when NO_3 was the source of N.

9445* Growth Repression of Higher Plants by 2-Pyridinethiol, 1-Oxide. A. G. Norman. *Plant Physiology*, v. 32, Jan. 1957, p. 16-19.

Growth repressant effect is manifest mainly in root development and function.

9446* Effect of Chemical Structure on the Growth Inhibition of Plants With Some Acid Analogs of 2-Mercaptobenzimidazole. Theodore L. Rebstock, Charles D. Ball, Charles L. Hamner, and Harold M. Sell. *Plant Physiology*, v. 32, Jan. 1957, p. 19-22.

9447* Some Effects of Ascorbic Acid and Metal-Complexing Agents on the Respiration of Barley Roots. S. I. Honda. *Plant Physiology*, v. 32, Jan. 1957, p. 23-31.

Ascorbate not only increased the O uptake but also inhibited the CO_2 production. Both effects were transitory and disappeared after the increased rate of O uptake accounted for the oxidative equivalent of the ascorbate added.

9448* Some Effects of Gibberellin on Flowering and Fruit Setting. S. H. Wittwer, M. J. Bukovac, H. M. Sell, and L. E. Weller. *Plant Physiology*, v. 32, Jan. 1957, p. 39-41.

Parthenocarpic fruit development in the tomato and earlier flowering in several plants was induced by treatment with gibberellin.

9449* Translocatable Plant Growth Inhibitors Produced by *Penicillium Thomii* and *Arachniotus Trisporus*. Roy W. Curtis. *Plant Physiology*, v. 32, Jan. 1957, p. 56-59.

9450* The Role of Soil Clay Minerals in Phosphorus Fixation. John B. Hemwall. *Soil Science*, v. 83, Feb. 1957, p. 101-108.

Phosphorus is "fixed" by clay minerals by reacting with soluble Al which originates from the exchange sites or from lattice dissociation of the clay minerals to form a highly insoluble aluminum phosphate compound called variscite.

9451* Relation Between Dithizone-Extractable Zinc in the Soil and Zinc Uptake by Corn Plants. H. F. Massey. *Soil Science*, v. 83, Feb. 1957, p. 123-129.

9452* Effect of Na and K on Corn and Crimson Clover Grown on Norfolk Sandy Loam at Two Residual K Levels. Ralph L. Wehunt, Matthias Stelly, and W. O. Collins. *Soil Science*, v. 83, Mar. 1957, p. 175-183.

9453* Plant Utilization of Zinc From Various Types of Zinc Compounds and Fertilizer Materials. Louis C. Boawn, Frank Viets, Jr., and Carl L. Crawford. *Soil Science*, v. 83, Mar. 1957, p. 219-227.

A Zn chelate, stripping acid residue, ZnO, $Zn_3(PO_4)_2$, $ZnCO_3$, blast furnace slag, Zn frits, and zinc granules were studied. Zinc utilization was greater from the chelate than from any other material including $ZnSO_4$.

9454* Influence of Soil Fumigation for Citrus Replants on the Fungus Population of the Soil. J. P. Martin, R. C. Baines, and J. O. Ervin. *Soil Science Society of America, Proceedings*, v. 21, Mar.-Apr. 1957, p. 163-166.

After marked reduction or near destruction of fungus populations, especially of the subsoils, fungi again became established but represented relatively few species in comparison with those in untreated soils.

9455* Effect of Particle Size on Availability and Mobility of Fused Tricalcium Phosphate and Rock Phosphate Compared With Other Phosphates in Contrasting Soil Types. J. R. Neller and F. D. Bartlett. *Soil Science Society of America, Proceedings*, v. 21, Mar.-Apr. 1957, p. 189-192.

9456 Designs for Potato Irradiation Facilities. L. E. Brownell, J. V. Nehemias, and J. J. Bulmer. *University of Michigan (U. S. Atomic Energy Commission)*, AECU-3184, Nov. 1954, 37 p. (UF767 U3au Contin.)

See also: **9556** (fertilizer manufacture); **9705** (activity of α-alkoxyarylacetic acids in plants).

BIOCHEMISTRY AND BIOPHYSICS

9457 Closeness of Fit and Forces Involved in the Reactions of Antibody Homologous to the *p*-(*p*'-Azophenylazo)-Benzoate Ion Group. Alfred Nisonoff and David Pressman. *American Chemical Society, Journal*, v. 79, Apr. 5, 1957, p. 1616-1622.

9458 The Reaction of Botulinum Toxin Type A With Ketene. Edward J. Schantz and Leonard Spero. *American Chemical Society, Journal*, v. 79, Apr. 5, 1957, p. 1623-1625.

The inactivation was accompanied by a small but continuous acetylation of free amino groups.

9459 Studies on Polypeptides. VIII. Synthesis of Peptides Related to Corticotropin. Klaus Hofmann, Albert Jöhl, Andreas E. Furlenmeier, and Heini Kappeler. **IX. Synthesis of Peptides Containing Basic Amino Acid Residues, Related to Corticotropin and Intermedin.** Klaus Hofmann, Heini Kappeler, Andreas E. Furlenmeier, Miriam E. Wooner, Eleanore T. Schwartz, and Thomas A. Thompson. *American Chemical Society, Journal*, v. 79, Apr. 5, 1957, p. 1636-1644.

9460 Clinical Chemistry. G. R. Kingsley. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 2, p. 615-624.

Review covers new journals, books, apparatus control methods, gasometric analysis, toxicology, and methods used in study of hypertension, phaeochromocytoma, and mental disease.

9461 Pharmaceuticals and Related Drugs. R. P. Haycock and W. J. Mader. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 2, p. 697-713.

A selective review of analytical procedures reported in the literature for 1955 to July 1956.

9462* (German.) Determination of the Constitution of Peptides and Proteins. **Konstitutionsermittlung bei Peptiden und Proteinen.** G. Braunitzer. *Angewandte Chemie*, v. 69, Mar. 21, 1957, p. 189-197.

A survey of the methods used for the determination of the terminal groups and the sequence of the amino acids. Modern methods of determining the constitution are described on the basis of examples concerning gramicidin-S, insulin, and tobacco mosaic virus.

9463* Evaluation of a Rapid (Hemoglobin Reduction) Method of Determining Antibiotic Susceptibility of Microorganisms. II. Modification of Technique. III. Application to Clinical Specimens From Pyogenic, Gastrointestinal, and Miscellaneous Infectious Processes. Joseph A. Bass, Frank B. Engley, Jr., Roland B. Mitchell, and T. G. Blocker, Jr. *Antibiotics & Chemotherapy*, v. 7, Apr. 1957, p. 160-171.

A modified technique for determining antibiotic sensitivity using whole blood as an indicator, is described. A rapid method for determining antibiotic sensitivity is applied to clinical specimens.

9464* The in Vitro Antifungal Activity of Triacetin. S. G. Knight. *Antibiotics & Chemotherapy*, v. 7, Apr. 1957, p. 172-174.

Both the fungi and serum contain an esterase which hydrolyzes triacetin releasing the fungistatic acetic acid.

9465* Nitrate Reductase From *Achromobacter fischeri*. Purification and Properties: Function of Flavines and Cytochrome. J. C. Sadana and W. D. McElroy. *Archives of Biochemistry and Biophysics*, v. 67, Mar. 1957, p. 16-34.

9466* Studies on the Role of "Metaphosphate" in Molds. II. The Formation of "Soluble" and "Insoluble" Metaphosphates in *Aspergillus niger*. P. S. Krishnan, S. P. Damle, and Violet Bajaj. *Archives of Biochemistry and Biophysics*, v. 67, Mar. 1957, p. 35-52.

9467* Immunochemical and Physical Chemical Properties of Carboxymethyl Proteins. Paul H. Maurer and Samuel Korman. *Archives of Biochemistry and Biophysics*, v. 67, Mar. 1957, p. 145-153.

9468* The Biosynthesis of Penicillin. V. Comparison of Valine and Hydroxyvaline as Penicillin Precursors. H. R. V. Arnstein and Margaret E. Clubb. *Biochemical Journal*, v. 65, Apr. 1957, p. 618-627.

Uniformly ^{14}C-labeled L-valine, DL-[α-^{14}C]-valine, DL-[^{15}N] valine and DL-β-hydroxy [*carboxy*-^{14}C] valine were compared as precursors in fermentations.

9469* The Reactions of Diazonium Compounds With Amino Acids and Proteins. A. N. Howard and F. Wild. *Biochemical Journal*, v. 65, Apr. 1957, p. 651-659.

Derivatives were prepared with compounds containing certain amino groups and guanidino, sulphydryl, and indolyl groups beside the phenolic group of tyrosine and the imidazole group of histidine which can react with diazo reagents.

9470* Fungal Detoxication. II. The Metabolism of Some Phenoxy-*n*-Alkylcarboxylic Acids by *Aspergillus Niger*. R. J. W. Byrde and D. Woodcock. *Biochemical Journal*, v. 65, Apr. 1957, p. 682-685.

Acids were hydroxylated in the *para* and to a lesser extent the *ortho* positions, both products in each case being less toxic to the fungus than the original acid.

9471* An Analytical Procedure for the Acid-Soluble Phosphorus Compounds in Rat-Skeletal Muscle. C. J. Threlfall. *Biochemical Journal*, v. 65, Apr. 1957, p. 694-699.

A method for the quantitative estimation of 95% of the phosphate compounds present in a perchloric acid extract of tissues.

9472* Hydrolysis of Amides by Extracts From Mycobacteria. Y. S. Halpern and N. Grossowicz. *Biochemical Journal*, v. 65, Apr. 1957, p. 716-720.

Extracts catalyzed the hydrolysis of L-asparagine, leucinamide, and valinamide; a slight activity was found towards L-glutamine and no activity at all towards phenylalaninamide.

9473* A Crystallographic Study of Some Derivatives of Gramicidin S. G. M. J. Schmidt, Dorothy Crowfoot Hodgkin, and Beryl M. Oughton. *Biochemical Journal*, v. 65, Apr. 1957, p. 744-746 + 1 plate.

Crystal morphology, unit cells, and space groups were determined, and a comparison between crystals in the wet and dry states was made.

9474* The Oxidation of Tryptamine to 3-Indolylacetaldehyde by Plant Amine Oxidase. A. J. Clarke and P. J. G. Mann. *Biochemical Journal*, v. 65, Apr. 1957, p. 763-774.

9475 Fractionation of Livetin and the Molecular Weights of the α- and β-Components. W. G. Martin, J. E. Vandegaer, and W. H. Cook. *Canadian Journal of Biochemistry and Physiology*, v. 35, Apr. 1957, p. 241-250.

Molecular weights determined by light scattering, osmotic pressure, and Archibald sedimentation procedure yielded respectively: 8.7, 7.8, and 6.7 X 10^4 for α-livetin, and 4.8, 5.0, and 4.5 X 10^4 for β-livetin.

9476 Cytogenetic Study on a Tetraploid Plant at the Diploid Chromosome Level. Karlis Lesins. *Canadian Journal of Botany*, v. 35, Mar. 1957, p. 181-196 + 2 plates.

Tetraploids of Grimm alfalfa are compared with their phylogenetically older diploid species.

9477* Characteristics of Bacteria Requiring the Terregens Factor. Margaret O. Burton. *Canadian Journal of Microbiology*, v. 3, Suppl., Mar. 1957, p. 107-112.

Seven organisms of the genus *Arthrobacter* are alike in that they are stimulated not only by the terregens factor but also by certain related substances that contain iron, namely coprogen, ferrichrome, and hemin. TF response is also obtained with aspergillic acid, soil extract, and liver extract.

9478* The Polysaccharide Produced by *Azotobacter Indicum*. Clara M. Quinnell, S. G. Knight, and P. W. Wilson. *Canadian Journal of Microbiology*, v. 3, Suppl., Mar. 1957, p. 277-288.

A procedure was developed for the isolation and purification of the polysaccharide.

9479* Bacteria Found in the Air Over Canada and the American Arctic. C. D. Kelly and Sharon Layne. *Canadian Journal of Microbiology*, v. 3, Apr. 1957, p. 447-455.

All bacteria are forms commonly found in the soil and include species of *Flavobacterium, Achromobacterium, Pseudomonas, Corynebacterium, Micrococcus, Sarcina*, and *Bacillus*.

9480* The Influence of Oxygen Availability on the Degree of Nitrate Reduction by *Pseudomonas Denitrificans*. V. B. D. Skerman and I. C. MacRae. *Canadian Journal of Microbiology*, v. 3, Apr. 1957, p. 505-530.

Nitrate reduction occurs only when the O concentration is below the critical level at which the O utilizing enzymes are saturated.

9481 (English, French, and German.) **Cell Chemistry.** Dean Burk, editor. 359 p. 1953. Elsevier Publishing Co., New York. (QH346 B91c)

A collection of 36 papers on miscellaneous aspects of cell chemistry.

9482 Chemical Constitution and Biological Activity. W. A. Sexton. 2nd Rev. Ed. 424 p. 1953. D. Van Nostrand Co., New York. (QP514 S91c2)

A review of modern advances in the application of synthetic organic substances to the control of living processes in both animals and plants, including organisms such as insects, molds, and various parasites.

9483* (English.) **Studies on the Chemical Constitution of Agar-Agar. Pyruvic Acid as a Constituent of Agar-Agar. I. Identification and Estimation of Pyruvic Acid in the Hydrolysate of Agar. II. Isolation of a Pyruvic Acid-Linking Disaccharide Derivative From the Methanolysis Products of Agar. III. Structure of the Pyruvic Acid-Linking Disaccharide Derivative Isolated From the Methanolysis Products of Agar.** Susumu Hirase. *Chemical Society of Japan, Bulletin*, v. 30, Jan. 1957, p. 68-79.

9484 Chemistry of the Vitamin B_{12} Group. IV. The Isolation of Crystalline Nucleotide-Free Degradation Products. R. Bonnett, J. R. Cannon, A. W. Johnson, and Alexander Todd. **V. The Structure of the Chromophoric Grouping.** R. Bonnett, et al. **VI. The Isomeric 5:6-Dimethylbenziminazole Nucleotides Produced by Hydrolysis of Vitamin B_{12}.** R. Bonnett, J. G. Buchanan, A. W. Johnson, and Alexander Todd. *Chemical Society, Journal*, Mar. 1957, p. 1148-1172.

9485* Localization of Deoxyribonuclease in Tissue Sections. A New Approach to the Histochemistry of Enzymes. R. Daoust. *Experimental Cell Research*, v. 12, Apr. 1957, p. 203-211.

Films made of deoxyribonucleic acid dispersed in gelatine were used.

9486* Volume Changes of Tissues in Physiological Fluids During Fixation in Osmium Tetroxide or Formaldehyde and During Subsequent Treatment. G. F. Bahr, G. Bloom, and U. Friberg. *Experimental Cell Research*, v. 12, Apr. 1957, p. 342-355.

9487* On the Nature of Growth Inhibition of *Escherichia Coli* by an Oxidation Product of Vitamin B_{12}. H. R. Alimchandani and A. Sreenivasan. *Indian Academy of Sciences, Proceedings*, v. 45, sec. B, Jan. 1957, p. 21-26.

9488* (French.) Physicochemical Aspects of the Study of Viruses. **Aspects physico-chimiques de l'étude des virus.** J. Beumer. *Industrie Chimique Belge*, v. 22, Mar. 1957, p. 285-294.

Application of physical and chemical methods to the study of viruses gives a fairly accurate knowledge of their constitution.

9489 Accelerated Bacteriophage Synthesis in Pentamidine-Treated *Escherichia Coli*. Harold Amos and Elizabeth Vollmayer. *Journal of Bacteriology*, v. 73, Feb. 1957, p. 178-185.

Concentrations of pentamidine markedly inhibitory to the growth of uninfected *E. coli* strain K-12 bring about a more rapid production of bacteriophage Tl in infected cells. Cells demonstrating accelerated synthesis of phage were found to increase their DNA earlier than untreated infected cells.

9490* The Sulfhydryl Character of D-Amino Acid Oxidase. Wilhelm R. Frisell and Leslie Hellerman. *Journal of Biological Chemistry*, v. 225, Mar. 1957, p. 53-62.

The activity of D-amino acid oxidase can be suppressed by sulfhydryl-reactive compounds such a *p*-chloromercuribenzoate, *o*-iodosobenzoate, γ-(*p*-arsenosophenyl)-*n*-butyrate, and phenylmercuric acetate Flavin adenine dinucleotide exerts a protective action by slowing the rate of attack of these agents on the apoenzyme.

9491* The Purification and Properties of β-Hydroxyisobutyric Dehydrogenase. William G. Robinson and Minor J. Coon. *Journal of Biological Chemistry*, v. 225, Mar. 1957, p. 511-521.

9492* Enzymatic Synthesis of Nicotinamide Mononucleotide. Jack Preiss and Philip Handler. *Journal of Biological Chemistry*, v. 225, Apr. 1957, p. 759-770.

9493* The Interconversion of Glutamic Acid and Proline. I. The Formation of Δ^1-Pyrroline-5-Carboxylic Acid From Glutamic Acid in Escherichia Coli. Harold J. Strecker. *Journal of Biological Chemistry*, v. 225, Apr. 1957, p. 825-834.

The addition of pyruvate, lactate, glucose, or formate increased the formation of Δ^1-pyrroline-5-carboxylic acid by washed resting cells of an (E. *coli*) mutant in the presence of either L-glutamate or L-glutamine.

9494* Electron Microscopy of Structural Detail in Frozen Biological Specimens. Russell L. Steere. *Journal of Biophysical and Biochemical Cytology*, v. 3, Jan. 25, 1957, p. 45-60 + 2 plates.

Electron micrographs showing details of the internal structure of plant virus crystals are presented to demonstrate the value of a procedure whereby preshadowed replicas can be obtained from frozen biological specimens which have been cut and then etched by sublimation of the ice from their surfaces

9495* The Structure of Some Cytoplasmic Components of Plant Cells in Relation to the Biochemical Properties of Isolated Particles. A. J. Hodge, E. M. Martin, and R. K. Morton. *Journal of Biophysical and Biochemical Cytology*, v. 3, Jan. 25, 1957, p. 61-70 + 2 plates.

Electron micrographs of thin sections of material fixed with buffered osmium tetroxide were used for comparison of the fine structure of isolated cytoplasmic particles from silver beet petioles and roots of germinating wheat with that of the cytoplasm of the intact cells

9496* The Effect of Ultraviolet Light on the Production of Bacterial Virus Protein. Itaru Watanabe. *Journal of General Physiology*, v. 40, Mar. 1957, p. 521-531.

9497 Hypotensive Agents. VI. Substituted 3-Azabicyclo [3.2.1] Octane Derivatives. Leonard M. Rice and Charles H. Grogan. *Journal of Organic Chemistry*, v. 22, Feb. 1957, p. 185-189.

9498* The Nature of the Changes Effected in Chromosomal Materials by the Chelating Agent EDTA. Berwind P. Kaufmann and Margaret R. McDonald. *National Academy of Sciences of the United States of America, Proceedings*, v. 43, Mar. 1957, p. 262-270.

The EDTA-induced chromosomal changes depend on modification of the general ionic environment of the cell and not merely on the selective removal of specific divalent cations from the fabric of the chromosomes.

9499* Spectrophotometric Examination of Hydrogenase and Nitrogenase in Soybean Nodules and Azotobacter. P. B. Hamilton, A. L. Shug, and P. W. Wilson. *National Academy of Sciences of the United States of America, Proceedings*, v. 43, Apr. 1957, p. 297-304.

Extracts of soybean nodules were exposed to various gases and the spectral changes observed. In the presence of N_2, hemoglobin is oxidized to hemiglobin; the opposite reaction is observed with H_2. The extracts slowly reduce added mammalian cytochrome-C and catalyze a slight deuterium-exchange reaction.

9500* Studies on the Photosynthetic Reaction. III. The Effects of Various Inhibitors Upon Growth and Carbonate-Fixation in *Chlorella Pyrenoidosa*. Arthur Tomisek, Mary R. Reid, William A. Short, and Howard E. Skipper. *Plant Physiology*, v. 32, Jan. 1957, p. 7-10.

Under conditions of growth inhibition bacitracin, erythromycin, and oxytetracycline appeared to have some stimulatory effect on carbonate fixation. Gliotoxin, thiolutin, polymyxin B, and streptomycin inhibited the carbonate fixation.

9501* Effect of Ionizing Radiations on Glucose Solutions. Christine T. Bothner-By and Endre A. Balazs. *Radiation Research*, v. 6, Mar. 1957, p. 302-317.

Irradiated solutions were investigated by means of potentiometric titration, spectrophotometry, and paper chromatography.

9502 Venoms. Eleanor E. Buckley and Nandor Porges, editors. 467 p. 1956. American Association for the Advancement of Science, Washington, D. C. (QP941 Am35v)

A collection of papers on the chemical constituents and pharmacology of venoms, symptoms and treatment of poisoning caused by various venoms, and statistics on snakebite mortality in different parts of the world.

9503* (Russian.) Hydrophilic Properties and Swelling Heat of Chitin. **Gidrofilnye svoistva i teploty nabukhaniia khitina.** N. I. Klenkova and E. A. Plisko. *Zhurnal Obshchei Khimii*, v. 27, Feb. 1957, p. 399-402.

The specific heat capacity of chitin is close to that of cellulose fibers (0.373 ± 0.03 cal.). The moisture absorbed by chitin at 100% of relative humidity, unlike cellulose fibers, freezes almost completely; this points to the absence in chitin of a large internal active surface.

See also: **9433** (clover root bacteria); **9435** (soil bacteria nutrition); **9587** (determination of Ca in serum); **9713** (anisic acid anesthetic); **9720** (iodine sanitizing solutions); **9764** (carcinostatic agents); **9774** (peptide synthesis); **9881** (cell kinetics); **10150** (bacterial food poisoning); **10152** (bacterial growth in orange juice); **10156** (sterilization of foods); **10174** (microbiology of coal); **10882** (biochemistry of lignin).

CERAMICS AND CONCRETE

9504 Resistivity Characteristics of Some Ceramic Compositions Above 1000°F. H. R. Wisely. *American Ceramic Society Bulletin*, v. 36, Apr. 1957, p. 133-136.

Several alkali-aluminum silicate bodies were found that had the required electrical characteristics to permit use for the determination of temperatures in the range from 1000 to 2000 F.

9505 Influence of Lithia Upon the Recrystallization of Titania. M. Dean Houston. *American Ceramic Society Bulletin*, v. 36, Apr. 1957, p. 139-141.

Conversion of anatase to rutile is aided by lithia additions; the complex silicate enamel glasses tend to devitrify with high concentrations of lithia.

9506 Effect of Stress and Temperature During Forming on Strength of Glass. E. D. Lynch and F. V. Tooley. *American Ceramic Society, Journal*, v. 40, Apr. 1957, p. 107-112.

Effect of mechanical stress during the drawing process on the strength obtained was determined for large-diameter fibers of soda-lime-silica glass. Variation of temperature and load during forming increased the strength of the drawn fiber as much as 62%.

9507 Phase Equilibria at Liquidus Temperatures in the System Iron Oxide-Al_2O_3-SiO_2 in Air Atmosphere. Arnulf Muan. *American Ceramic Society, Journal*, v. 40, Apr. 1957, p. 121-133.

9508 Sintering of Alumina at Temperatures of 1400°C and Below. Ivan B. Cutler, Cyril Bradshaw, Carl J. Christensen, and Edmond P. Hyatt. *American Ceramic Society, Journal*, v. 40, Apr. 1957, p. 134-139.

By utilizing combinations of oxides and small particle size, the sintering temperature of 96% alumina bodies was reduced to the 1300 to 1400 C range. It is suggested that this low-temperature sintering is aided by the formation of a liquid phase.

9509 Oxidation of Manganese Ferrite. R. S. Weisz. *American Ceramic Society, Journal*, v. 40, Apr. 1957, p. 139-142.

Between 1050 and 1150 C a homogeneous oxidation takes place, resulting in a spinel phase of a defect type containing up to 10% of the Mn in the trivalent state. At 1050 C and below, bixbyite (Mn_2O_3) and hematite (Fe_2O_3) are precipitated.

9510 Properties of Beryllium Oxide and Carbides of Beryllium, Molybdenum, Niobium, Tantalum, and Titanium. William P. Weber, John F. Quirk, Alexis W. Lemmon, Jr., and Robert B. Filbert, Jr. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-1165, Feb. 1957, 36 p. (UF767 U3b Contin.)

9511 Improvements in the Quality of Silica Roof Bricks. W. M. Fern. *British Ceramic Society, Transactions*, v. 56, Mar. 1957, p. 110-132.

The best quality bricks are those with about 0·20% Al_2O_3, $<$0·10% alkalis, and $<$20·0% apparent porosity. One of the few remaining means of improving quality is to decrease porosity.

9512* (French.) A Study With the Electron Microscope of the Alteration of Kaolinite Crystals. **Étude en microscopie électronique de l'altération des cristaux de kaolinite.** Agnès Oberlin and Cyrille Tchoubar. *Comptes Rendus*, v. 244, Mar. 11, 1957, p. 1524-1526.

A kaolinite specimen was subjected for 31 days to a regular cycle of water washing and heating at 80 C. The change of structure was studied with the electron microscope.

9513 Semiconducting Properties of Some Vanadate Glasses. P. L. Baynton, H. Rawson, and J. E. Stanworth. *Electrochemical Society, Journal*, v. 104, Apr. 1957, p. 237-240.

Glasses with the highest V_2O_5 contents had a specific conductivity of the order of 10^{-5} ohm^{-1} cm.$^{-1}$ at room temperature.

9514* (Italian.) A Contribution to the Knowledge and Description of the Properties of Bentonites. **Contributo alla conoscenza ed al rilevamento delle proprietà delle bentoniti.** Franz Hofmann. *Fonderia*, v. 6, Jan. 1957, p. 1-9.

Definition of bentonites; their hygroscopic and binding properties; relationship between various properties; application to foundry practice.

9515 (French.) Use of the S. K. Porosimeter for Measuring the Porosity of Refractories. **L'emploi du porosimetre S. K. pour les mesures de porosites des produits refractaires.** J. Baron. *Institut de Recherches de la Sidérurgie, Publications*, ser. A, no. 161, Mar. 1957, 7 p. (Reprinted from *Bulletin de la Société Française de Céramique*, no. 33, Oct.-Dec. 1956, p. 25-31.) (TN602 In7p Vis.)

Measurements are based on the determination of the volume of a complementary filler liquid in a graduated vessel containing the substance for study. The volumes of the substance in Hg, water, and air are thus obtained by difference.

9516* Low Loss Magnesium Manganese Ferrites. L. C. F. Blackman. *Journal of Electronics*, v. 2, ser. 1, Mar. 1957, p. 451-456.

Preparation, by the method of thermal decomposition of mixed nitrates, of a ferrite of low microwave energy loss at Q-band.

9517* (French.) Granular Surface Structures in Iron Oxide Ceramics. **Structures granulaires a couche superficielle dans les céramiques a base d'oxyde de fer.** J. Suchet. *Journal de Physique et le Radium (Suppl.)*, v. 18, Mar. 1957, p. 10A-18A.

A study of two semi-conductive materials. A physical interpretation of the phenomena taking place during sintering, especially the effects of the thermal cycle and of the oxidizing atmosphere.

9518* (Russian.) Efficiency in Service of Refractory Material of the Brick Lining of Steel Casting Ladles. **Sluzhba ogneuporov v futerovke stalerazlivochnykh kovshei.** A. R. Makarychev. *Ogneupory*, v. 22, no. 3, 1957, p. 105-109.

A comparison of properties of linings of large casting ladles at three different plants including sp. wt., porosity, refractoriness, and other characteristics.

9519* (Spanish.) Electrical Properties of Ceramic Materials. **Propiedades eléctricas de los materiales cerámicos.** Luis Ferrer Olmos. *Revista de Ciencia Aplicada*, v. 11, Jan.-Feb. 1957, p. 32-39.

Electrical properties of porcelains, especially dielectric characteristics. Thickness of the tested sample is an important factor. A survey of new materials including semiconductors and ferromagnetic ceramic products.

9520* (French.) Determining the Absorbed Power in Grinding Mills and That Lost by the Sliding of the Charge. **Détermination de la puissance absorbée dans les broyeurs à boulets et de la puissance perdue par le glissement de la charge.** V. Freymann. *Revue des Matériaux de Construction*, C, Feb. 1957, p. 55-62.

9521* (French.) Research on "High Turbulence" Grout Mixing. **Recherches sur le malaxage à "haute turbulence" des suspensions de ciment.** Michel Papadakis. *Revue des Matériaux de Construction*, C, Mar. 1957, p. 69-78.

Rheological characteristics of "high-turbulence" grouts show that they have a flow and stability, especially suited to injection work.

9522* (French.) Preparation of High-Strength Concrete. **La préparation des bétons à hautes résistances.** H. Manche. *Revue des Matériaux de Construction*, C, Mar. 1957, p. 83-89.

Comparison of various tests for determining strength. Effects of composition and mixing procedure on strength.

9523* (French.) Automatic Control of a Glass Tank Feeder. **Régulation automatique d'un feeder de verrerie.** M. Verburgh. *Silicates Industriels*, v. 22, Feb. 1957, p. 95-103.

Description and operation of equipment for keeping constant the temperature and liquid level of the glass.

9524 The Colours Produced in Glasses by Exposure to Radiations. P. L. Baynton and H. Moore. *Society of Glass Technology, Journal*, v. 40, June 1956, p. 187T-251T.

Coloration is attributed to an increase in the valency of some constituent ion which is capable of existing in more than one valency state; and the liberation of electrons from other ions in the glass and the trapping of these electrons in positions where an "oxygen vacancy" exists in the structure.

9525 Low Expanding 'Solder' Glasses in the System ZnO-B_2O_3-V_2O_5. E. P. Denton and H. Rawson. *Society of Glass Technology, Journal*, v. 40, June 1956, p. 252T-259T.

A glass was developed which forms vacuum-tight joints at 625 C.

9526* (German.) Highly Refractory Pink Stains—Their Preparation and Use. **Hochfeuerbeständiger Rosa-Farbkörper—seine Herstellung und Verwendung.** Fritz Viehweger. *Sprechsaal*, v. 90, Mar. 1957, p. 129-130.

Preparation, use, and behavior in various glazes, and under glaze and overglaze colors.

9527* (Russian.) Influence of Chemical Composition of Glass on Its Hardening. **Vliianie khimicheskogo sostava stekla na ego zakalku.** G. M. Bartenev and A. I. Kolbasnikova. *Steklo i Keramika*, v. 14, Mar. 1957, p. 1-5.

Hardness as a function of physical-chemical properties of glass.

9528 Research on Elevated Temperature Resistant Ceramic Structural Adhesives. Charles N. Williams, Henry G. Lefort, and Dwight G. Bennett. *University of Illinois, Department of Ceramic Engineering, Progress Report No. 22, for Materials Laboratory, WADC Contract No.* 33(616)-2556, Dec. 21, 1956-Feb. 20, 1957, 16 p. (TP785 IL6.82r Contin.)

One adhesive, when applied during the hardening treatment required to obtained conditions RH 950 in Type 17-7 PH stainless steel, yielded shear strengths of about 1,000 psi. up through 1,000 F.

See also: **10622** (electrical conductivity of graphite); **10752** (properties of $BaTiO_3$); **10774** (glass fibers for resin reinforcement).

CHEMICAL ENGINEERING

9529* (English.) **Studies on the Extraction of Metal Complexes. XXVII. The Distribution of Some Actinides and Fission Products Between Methyl Isobutyl Ketone and Aqueous Solutions of HNO_3 and $Ca(NO_3)_2$.** Jan Rydberg and Brita Bernström. *Acta Chemica Scandinavica*, v. 11, no. 1, 1957, p. 86-97.

9530 Applications of Ultrasonic Energy. *Aeroprojects Incorporated (U. S. Atomic Energy Commission)*, NYO-7789, Feb. 1957, 22 p. (UF767 U3ny Contin.)

The dissolution of disks of Mo, Zircaloy-2, and Type 304 stainless steel sheet in hot acid solutions was markedly accelerated by close-proximity ultrasonic treatment. Acoustic intensity in molten Bi was found to be high in the cavitation zone adjacent to the ultrasonic coupler face, but to drop off rapidly with distance. Significant factors in ultrasonic application to several powder metallurgy problems were examined.

9531* (German and French.) Aluminum in the Manufacturing of Chemical Apparatus. **Aluminium im chemischen Apparatebau.** E. Moor. *Aluminium Suisse*, v. 7, Mar. 1957, p. 43-56.

Aluminum and Al alloys used in the chemical industry. Corrosion resistance; structural problems; surface treatment; assembling processes; maintenance methods.

9532 Study of Bubbling Performance in Relation to Distillation and Absorption. Ju Chin Chu, John Forgrieve, Robert Grosso, S. M. Shah, and Donald F. Othmer. *A.I.Ch.E., Journal*, v. 3, Mar. 1957, p. 16-28.

Determination of interfacial area and contact time for the formation of air bubbles submerged in water and aqueous solutions.

9533 Mass and Heat Transfer From Drops in Liquid-Liquid Extraction. A. E. Handlos and T. Baron. *A.I.Ch.E., Journal*, v. 3, Mar. 1957, p. 127-136.

9534 Applied Mathematics in Chemical Engineering. Harold S. Mickley, Thomas K. Sherwood, and Charles E. Reed. 2nd Ed. 413 p. 1957. McGraw-Hill, New York. (TP149 Sh58a2)

Text takes the student with a limited mathematical background by a step-by-step procedure from elementary situations through applications of highly advanced techniques to complicated physical processes. The chief categories covered are treatment and interpretation of engineering data and analysis of situations involving two or more independent variables.

9535* The Development of a Gas/Liquid Separator. D. I. J. Roderick and C. E. Hierons. *British Chemical Engineering*, v. 2, Apr. 1957, p. 180-184.

Efficiency of this glass separator lies between 70 and 95% over a fairly wide velocity range.

9536* Brittle Fracture: A Hazard in Chemical Plant. A. A. Wells. *British Chemical Engineering*, v. 2, Apr. 1957, p. 186-191.

Conditions which give rise to brittle fracture failures; practical precautionary measures.

9537 A Fluidized Bed Process for the Production of Uranium Tetrafluoride. N. M. Levitz, E. J. Petkus, H. M. Katz, and A. A. Jonke. *Chemical Engineering Progress*, v. 53, Apr. 1957, p. 199-202.

Operating results from 3-in. fluidized bed calciner operating in the range 390 to 700 C.

9538 Midget Hydroclones Remove Micron Particles. P. A. Haas, E. O. Nurmi, M. E. Whatley, and J. R. Engel. *Chemical Engineering Progress*, v. 53, Apr. 1957, p. 203-207.

Dimensional and flow capacity correlations are reported from operation of hydroclones of less than 1-in. diameter for removing particles as small as 1μ from aqueous solutions.

9539 Chemical Processing and Equipment. 302 p. 1955. McGraw-Hill, New York. (QD53 Un3.1ca)

Process and engineering design features of a plant system designed to reclaim highly enriched U from irradiated fuel elements made of an Al-clad alloy or enriched U and Al. Catalog of special equipment for the handling of radioactive materials.

9540* (German.) Liquid-Liquid Equilibria in Some Ternary Systems and Counter-Current Extraction in a Horizontal Pipe. **Gleichgewichte flüssig/flüssig in einigen ternären Systemen und Gegenstrom-Extraktion in einem horizontalen Rohr. I. Basis. Grundlagen.** S. Röthlin, Jan L. Crützen, and Georg R. Schultze. *Chemie-Ingenieur-Technik*, v. 29, Mar. 1957, p. 211-219.

In connection with the separation of trichlorethylene-methanol mixtures and recovery of dimethylformamide with benzol as the added component, the liquid-liquid equilibria of the ternary system water-trichlorethylene-methanol and benzol-dimethylformamide-water were investigated.

9541 Heat Transfer. F. J. Van Antwerpen, editor. v. LII. No. 18. 115 p. 1956. American Institute of Chemical Engineers, New York. (QC320 Am35he)

Consists of 13 papers from the A.I.C.E. Symposium at Louisville. Includes one paper on heat transfer by liquid Hg and Na.

9542 General Purpose Hydrogenation Pilot Plant. R. S. Manne, H. G. Boynton, and A. M. Souby. *Industrial and Engineering Chemistry*, v. 49, Apr. 1957, p. 640-645.

Plant charges from ½ to about 3 barrels of oil per day. It is equipped to operate either with once-through or recycle gas which may be either commercial cylinder H or tail gas from a plant catalytic reformer. A continuous vacuum flash tower in the product recovery section allows recycle of residuum.

9543 Naphtha Processing Over Platforming Catalyst. Effect of Sulfur on Catalyst Life. William K. Meerbott, Alan H. Cherry, John N. Limbach, Jr., and Burton W. Arnold. *Industrial and Engineering Chemistry*, v. 49, Apr. 1957, p. 650-655.

Commercially satisfactory catalyst life is attained in producing gasoline from East-West Texas naphtha containing 0.07 wt.% or less of S.

9544 Hydrotreating Cracking Stocks. C. R. Eberline, R. T. Wilson, and L. G. Larson. *Industrial and Engineering Chemistry*, v. 49, Apr. 1957, p. 661-663.

Mild hydrogenation of cracking stocks can reduce C deposition 30%, S and heavy metals content 90%, and practically eliminate H_2S formation.

9545 Hydrogenation of Asphalt for Fuel Products. G. T. Gwin, R. L. Heinrich, E. J. Hoffmann, R. S. Manne, H. W. H. Meyer, J. R. Miller, and C. L. Thorpe. *Industrial and Engineering Chemistry*, v. 49, Apr. 1957, p. 668-672.

A catalytic hydrogenation process employing $CoMoO_4$ catalyst at a pressure of 200 to 800 psi.g. converts petroleum asphalt residues to distillate fuel products such as gasoline, light heating oil, and gas oil for catalytic cracking.

9546 Gasoline Production From Coal Tar Oils. Harry Cough. *Industrial and Engineering Chemistry*, v. 49, Apr. 1957, p. 673-678.

By minor operating changes and improving catalysts, this British hydrogenolysis plant produces motor and aviation gasolines from creosote that compete with the rising octane numbers of premium grades.

9547 Hydrogenating Shale Oil to Catalytic Reforming Stock. P. L. Cottingham, E. R. White, and C. M. Frost. *Industrial and Engineering Chemistry*, v. 49, Apr. 1957, p. 679-684.

The effects of hydrogenation temperatures between 760 and 1010 F were studied. Gasolines obtained at the higher temperatures had better properties but total liquid yields were better at lower temperatures. Operation at about 900 F appears best.

9548 Low Temperature Recovery of Hydrogen From Refinery Gases. D. F. Palazzo, W. C. Schreiner, and G. T. Skaperdas. *Industrial and Engineering Chemistry*, v. 49, Apr. 1957, p. 685-688.

The gases are cooled and the bulk of the hydrocarbons condensed out. A liquid propane wash removes the remaining hydrocarbon impurities and produces a stream containing up to 99.9+% H by volume. The propane is regenerated by stripping it with part of the product.

9549 Operation and Performance of Bench Scale Reactors. J. R. Snyder, P. F. Hagerty, and M. C. Molstad. *Industrial and Engineering Chemistry*, v. 49, Apr. 1957, p. 689-695.

Advantages of a dashing reactor over a shaker or rocker reactor include high rate of gas absorption and high useful volume.

9550 Limiting Currents in Membrane Cells. N. W. Rosenberg and C. E. Tirrell. *Industrial and Engineering Chemistry*, v. 49, Apr. 1957, p. 780-784.

Hydrodynamic control may solve the problem of capacity and investment cost in electrodialysis for demineralizing waters in arid regions. High linear velocities, thin cell spacing, and in the streamline flow region, closely spaced eddy-promoting obstructions are desirable to maximize permissible current densities.

9551 The Institute of Petroleum Safety Codes. Sections individually paged. 1956. Institute of Petroleum, London. (TN 871 In7mo)

A looseleaf manual containing electrical, marketing, and refinery safety codes.

9552 Heat Transfer Media for Use at Elevated Temperatures. P. A. Rottenburg. *Institution of Chemical Engineers, Transactions*, v. 35, no. 1, 1957, p. 21-36.

The commercially available media are surveyed and their important physical properties tabulated.

9553 The Control of Reactions at Elevated Temperatures. P. A. Rottenburg. *Institution of Chemical Engineers, Transactions*, v. 35, no. 1, 1957, p. 37-50.

A rapid method of evaluating the transfer properties of heat transfer media. Control of a multitubular reactor operating at 400 C with endothermic and exothermic reactions. Relative costs using various heat transfer media.

9554 Ammonium Phosphates Via Wet Process Acid. George Burnet, Jr. *Journal of Agricultural and Food Chemistry*, v. 5, Apr. 1957, p. 258-263.

Technical and economical comparison of competitive processes for using wet process acid to make ammonium phosphates.

9555 Tri-*n*-Butyl Phosphate as an Extracting Solvent for Inorganic Nitrates. I. Zirconium Nitrate. K. Alcock, F. C. Bedford, W. H. Hardwick, and H. A. C. McKay. *Journal of Inorganic and Nuclear Chemistry*, v. 4, Mar. 1957, p. 100-105.

Extraction of Zr from aqueous solutions by 0.69 *M* tri-*n*-butyl phosphate in kerosene was studied.

9556* (Russian.) Certain New Technological Schemes of Production of Concentrated and Complex Fertilizers. **Nekotorye novye tekhnologicheskie-skhemy proizvodstva kontsentrirovannykh i slozhnykh udobrenii.** B. D. Melnik. *Khimicheskaia Promyshlennost'*, no. 1, Jan.-Feb. 1957, p. 5-13.

Methods of production of double superphosphate and complex fertilizers.

9557 A Study of Entrainment and Leakage in Slat-Tray Towers by Means of Radioactive Tracers. Bruce D. Giles, Charles E. Dryden, and Charles E. Lapple. *News in Engineering at Ohio State University*, v. 29, Apr. 1957, p. 7-12.

A P^{32} concentration of 0.6 to 0.9 microcurie per 1. was found most favorable for determining liquid entrainment and leakage.

9558 Planning and Precautions for Acid Cleaning a Catalytic Reforming Unit. Donald M. O'Neill. *Petroleum Engineer (Management Ed.)*, v. 29, Apr. 1957, p. C10-C12.

9559 Adsorption—The Process to Watch. W. M. Dow. *Petroleum Refiner*, v. 36, Apr. 1957, p. 141-145.

Details of a fixed-bed unit recently developed to recover natural gasoline from small volume, lean gas streams.

9560 Better Stripping & Absorption Factors. R. O. Shelton. *Petroleum Refiner*, v. 36, Apr. 1957, p. 153-160.

Series of charts permits rapid evaluation of average absorption or stripping factors in a separation tower.

9561 Fluid Catalyst Design Data. I. How Solid Catalysts Behave. Frederick A. Zenz. *Petroleum Refiner*, v. 36, Apr. 1957, p. 173-178.

Flow characteristics of bulk solids are defined and organized into a logical pattern.

9562 Find Catalyst Density With Isotopes. R. H. Hunt, W. R. Biles, and C. O. Reed. *Petroleum Refiner*, v. 36, Apr. 1957, p. 179-182.

Technique uses radioisotopes for quickly determining catalyst distribution in all phase regions of cat cracking units.

9563* (Polish.) Industrial Application of the Method of Utilization of Waste Hydrogen for Hydrogenation of Phenol. **Wprowadzenie do przemysłu metody wykorzystania wodoru odpadkowego do unwodorniania fenolu.** Zb. Leszczński. *Przemysł Chemiczny*, v. 13, Feb. 1957, p. 103-107.

Hydrogen from the Synthesis of cyclohexanone is regenerated by removing vapors of organic compounds by adsorption on activated carbon and removing Co by methanization without pressure. Such H can be used for pressure hydrogenation of phenol.

9564* (English.) **Flocculation at Sedimentation. II. Forced Sedimentation Within Particle Pairs.** Olle Andersson. *Svensk Papperstidning*, v. 60, Mar. 15, 1957, p. 153 + 4 pages.

Studies of the mutual influence on sedimentation speed within pairs of spherical particles sedimenting in a liquid at low Reynolds numbers.

See also: **9811** (chemical engineering data); **9884** (boiling-point computation); **9945** (computer refinery simulator); **10158** (carbonization of coal); **10224** (preparation of reports); **10682** (recovery of nuclear fuels); **10833** (prevention of air pollution).

CHEMISTRY—ANALYTICAL

9565* (English.) **Separation of Purines and Pyrimidines by Paper Electrophoresis.** Giorgio Semenza. *Acta Chemica Scandinavica*, v. 11, no. 1, 1957, p. 24-27.

9566* (English.) **Quantitative Determination of the Individual Tocopherols by Chromatography on Secondary Magnesium Phosphate.** Finn Bro-Rasmussen and W. Hjarde. *Acta Chemica Scandinavica*, v. 11, no. 1, 1957, p. 44-52.

9567 Infrared Investigation of the Thermal Decomposition of Di-*t*-Butyl Peroxide and Nitrate Esters in Potassium Halide Pressed Disks, and the Spectrum of Carbon Dioxide at High Pressures. Henry A. Bent and Bryce Crawford, Jr. *American Chemical Society, Journal*, v. 79, Apr. 20, 1957, p. 1793-1797.

Appears to be a safe and convenient way to study decomposition of unstable compounds spectroscopically.

9568* Analytical Applications of the Barker Square-Wave Polarograph. III. Orthophosphoric Acid as a Solvent and Base Electrolyte in Direct Inorganic Polarographic Analysis. G. W. C. Milner and L. J. Slee. *Analyst*, v. 82, Mar. 1957, p. 139-151.

The use of a phosphoric acid base electrolyte in conjunction with the square-wave polarograph has resulted in considerable

improvement in the analytical methods for the determination of Cu, Pb, Cd, and Zn contents of various materials, particularly metallurgical alloys, including Cu, Sn, Pb, Al, and Zn-base alloys.

9569* A Systematic Scheme of Semi-Micro Qualitative Analysis for Anionic Surface-Active Agents. H. Holness and W. R. Stone. *Analyst*, v. 82, Mar. 1957, p. 166-176.

9570* A Method for the Detection and Determination of Iodide in the Presence of Chloride. M. Z. Barakat, M. F. Abd El-Wahab, and M. M. El-Sadr. *Analyst*, v. 82, Mar. 1957, p. 192-196.

Bismuth-2-mercaptothiazoline and antimony-2-mercaptothiazoline reagents are proposed for the detection of iodide, in presence of bromide, chloride, or fluoride.

9571* (English.) **Determination of Active Titanium in Titanium Powder Used in Pyrotechnics.** M. Codell, R. P. Egan, and G Norwitz. *Analytica Chimica Acta*, v. 16, Mar. 1957, p. 228-233.

Sample is dissolved in a mixture of fluoboric and sulfuric acids and the volume of H evolved in the reaction is measured.

9572* (English.) **Hydrazinophthalazines. I. Organic Reagents for the Determination of Iron.** R. Ruggieri. *Analytica Chimica Acta*, v. 16, Mar. 1957, p. 242-248.

Hydrazinonaphthalazine and dihydrazinonaphthalazine are proposed as reagents for determining ferric Fe and V.

9573* (English.) **Analysis of the Terphenyls by a Compressed Pellet Infrared Method Involving Micro-Distillation.** Eugene L. Colichman, Raymond F. Fish, and George O. Bjarke. *Analytica Chimica Acta*, v. 16, Mar. 1957, p. 250-258.

9574* (English.) **Coulometric Titration of Antimony With Electrogenerated Iodine.** James J. Lingane and Allen J. Bard. *Analytica Chimica Acta*, v. 16, Mar. 1957, p. 271-273.

Iodometric titration can be performed with potentiometric, amperometric, or visual e.p. indication, and is applicable in the presence of substances which would interfere with a bromometric titration.

9575 Determination of Stigmasterol in Soy Sterols by Radioactive Isotope Dilution. Robert A. Donia, Arnold C. Ott, and Norman Drake. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 1, p. 464-467.

Stigmasteryl C^{14}-acetate of known specific activity is added to the soy sterols. Sparingly soluble stigmasteryl C^{14}-acetate is isolated and its activity and purity determined by Br analysis. Stigmasterol concentrations are calculated from the ratio of activities.

9576 The Morphine-Marmé Complex. Leo Levi. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 1, p. 470-474.

The complex $[C_{17}H_{19}NO_3]$ $[Cd\ I_2]$ is formed when a CaI_2-KI solution reacts with morphine hydrochloride. Sensitivity of the test increases with KI concentration and is dependent on reagent-reactant ratio.

9577 Polarographic Determination of Ammonia and Ethylenediamine. C. J. Nyman and R. A. Johnson. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 1, p. 483-485.

Mercury dissolves in dilute solutions of these materials, forming either a complex or mercury (II) hydroxide. The anodic diffusion current is proportional to concentration of amine or ammonia up to 50×10^{-4} M.

9578 Fluorometric Determination of 11-Desmethoxyreserpine. James A. Gordon and Donald J. Campbell. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 1, p. 488-490.

Fluorescence of the compound is greatly increased by reaction with 0.001 *N* Ce $(SO_4)_2$ in 0.1 *N* H_2SO_4.

9579 Spectrophotometric Determination of Tellurium. M. W. Hanson, W. C. Bradbury, and J. K. Carlton. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 1, p. 490-491.

9580 Determination of Acetyl Content of Cellulose Acetate by Near Infrared Spectroscopy. J. A. Mitchell, C. D. Bockman, Jr., and A. V. Lee. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 1, p. 499-502.

9581 Analysis of Polyisoprenes by Infrared Spectroscopy. John L. Binder and H. C. Ransaw. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 1, p. 503-508.

9582 Polyanion-Stabilized Diazonium Cations and Diazonium Spot Test Papers as Analytical Reagents. Jack L. Lambert and Vernon E. Cates. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 1, p. 508-512.

9583 Time-Temperature Cooling Curves. Simplified Determination of Compound Purity. K. Leroi Nelson. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 1, p. 512-518.

Simplified apparatus and procedure for determining freezing points and purity of compounds from time-temperature cooling and melting curves.

9584 Spectrographic Determination of Lead in Leaded Steel. James E. Paterson. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 1, p. 526-527.

9585 Flame Spectrophotometric Determination of Copper, Nickel, and Manganese in Aluminum-Base Alloys. John A. Dean and Carl Cain, Jr. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 1, p. 530-532.

9586 Determination of Titanium in Plutonium-Titanium Alloys. Karl S. Bergstresser. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 1, p. 532-534.

From 50 to 500γ of Ti can be determined in a solution containing 50 mg. of Pu by use of H_2O_2.

9587 Flame Photometric Determination of Calcium in Biological Material. Effect of Low Level Impurities From Calcium Oxalate Precipitation. T. Y. Toribara, Priscilla A. Dewey, and Huber Warner. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 1, p. 540-543.

9588 Determination of Mercury in Presence of Halides. Rapid Amperometric Titration. E. P. Parry. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 1, p. 546-549.

From 0.02 to 0.06 *M* divalent Hg can be determined by simple amperometric titration of iodomercurate (II) ion with bis (ethylenediamine) Cu (II) ion. Sodium sulfite is used to remove O.

9589 Colorimetric Determination of Ruthenium. Samuel B. Knight, Ross L. Parks, Sarah C. Leidt, and Kenneth L. Parks. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 1, p. 571-574.

s-Diphenylthiourea has favorable colorimetric properties as a reagent for Ru; its stability of color, specificity for Ru, and compatibility with the other Pt metals were studied.

9590 Complexometric Titrations Following Cupferron Separation of Interferences. James S. Fritz, Marlene Johnson Richard, and Ann Sutton Bystroff. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 1, p. 577-579.

Thorium, Zr, and large amounts of Fe, which interfere with the titration of divalent metal ions with EDTA, can be rapidly and cleanly removed by one extraction of their cupferron complexes. Extraction is made with a 1 to 1 mixture of benzene and isoamyl alcohol from an acid solution (pH 0.3 to 1.0).

9591 Estimation of Melamine in Presence of Guanidine. R. M. Engelbrecht, H. E. Moseley, W. P. Donahoo, and W. R. Rolingson. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 1, p. 579-580.

Three methods are given.

9592 Detection of Traces of Iron. Fritz Feigl and Alcides Caldas. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 1, p. 580-582.

A 2% solution of 2,2'-bipyridine or phenanthroline in concentrated thioglycolic solution will give the characteristic red color of bivalent Fe with traces of trivalent Fe.

9593 Automatic Operations in Analytical Chemistry. Gordon D. Patterson, Jr. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 2, p. 605-614.

Review of new instruments and techniques covers sampling, treatment, separation, and measurement, with comments on general trends and handling of data.

9594 Essential Oils and Related Products. Ernest Guenther, Kurt Kulka, and James A. Rogers. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 2, p. 630-637.

A review of analytical procedures, covering the literature from Oct. 1954 to Sept. 1956.

9595 Ferrous Metallurgy. H. F. Beeghly. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 2, p. 638-643.

Methods for analysis of ferrous materials published during the period Nov. 1, 1954, to Oct. 30, 1956 are reviewed.

9596 Nonferrous Metallurgy. M. L. Moss. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 2, p. 670-678.

The recent literature on chemical analysis of non-ferrous metallurgical materials is reviewed.

9597 Petroleum. R. L. LeTourneau. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 2, p. 684-697.

Comprehensive and selective review of recent literature on the analysis and testing of petroleum.

9598 Water Analysis. S. K. Love and L. L. Thatcher. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 2, p. 722-734.

Review of analytical procedures covers outstanding papers published in 1955-1956.

9599 Chemical Analysis of Surfaces by Nuclear Methods. Sylvan Rubin, Thomas O. Passell, and L. Evan Bailey. *Analytical Chemistry*, v. 29, May 1957, p. 736-743.

Theory of the scattering method, and determinations of O, Al, Si, S, Ca, Fe, Cu, Ag, Ba, and Pb by the scattering method are described. Methods are applicable to the detection of all elements to a depth of several microns.

9600 Study of Accuracy in Chemical Analysis Using Linear Calibration Curves. John Mandel and Frederic J. Linnig. *Analytical Chemistry*, v. 29, May 1957, p. 743-749.

The usual method for deriving confidence intervals for the slope and the intercept of the fitted straight line may lead to erroneous conclusions. The difficulty results from the interdependence of multiple conclusions drawn from the same data. The method of joint confidence regions eliminates these difficulties.

9601 Spectrophotometric Determination of Copper in Titanium. Andrew J. Frank, Arthur B. Goulston, and Americo A. Deacutis. *Analytical Chemistry*, v. 29, May 1957, p. 750-754.

The chloroform-alcohol extraction of a copper(I) neocuproine complex was used.

9602 Prewaves and Postwaves in the Polarography of Phenyl Ketones. Philip J. Elving and Joseph T. Leone. *Analytical Chemistry*, v. 29, May 1957, p. 782-784.

Waves are due to the effect of ultra-violet radiant energy on the solvent used to prepare stock solutions of the carbonyl compound.

9603 Separation of Hydrogen, Oxygen, Nitrogen, Methane, and Carbon Monoxide by Gas Adsorption Chromatography. George Kyryacos and C. E. Boord. *Analytical Chemistry*, v. 29, May 1957, p. 787-788.

A molecular sieve column, Type 5A, was used to determine quantitatively the O consumed in the oxidation of hydrocarbons.

9604 Applications of Anion Exchange Resins to Determination of Boron. John D. Wolszon, John R. Hayes, and William H. Hill. *Analytical Chemistry*, v. 29, May 1957, p. 829-832.

A simple, rapid chromatographic technique employs chloride ion as an elution indicator. Boron is separated from most of the known titrimetric interferences by a mixed bed ion exchange column.

9605 Selective Precipitation of Thorium Iodate From a Tartaric Acid-Hydrogen Peroxide Medium. Application to Rapid Spectrophotometric Determination of Thorium in Silicate Rocks and in Ores. F. S. Grimaldi, Lillie B. Jenkins, and Mary H. Fletcher. *Analytical Chemistry*, v. 29, May 1957, p. 848-851.

Minimum limits are 0.001 to 0.01% Th.

9606* (German.) Ion Exchangers in Analytical Chemistry. Developments in Recent Years. **Ionenaustauscher in der analytischen Chemie. Entwicklungen in den letzten Jahren.** U. Schindewolf. *Angewandte Chemie*, v. 69, Apr. 7, 1957, p. 226-236.

The effectiveness of an ion exchange method is determined by the equilibrium constants of the ions, which are influenced by different factors as extraction agents and complex formers. An extensive table offers numerous separation processes for inorganic ions with literature references.

9607* (German.) Photoelectric Spectrometer for Testing Steels. **Lichtelektrisches spektrometer für die Untersuchung von Stählen.** Hans Diebel and Wilhelm Hanle. *Archiv für das Eisenhüttenwesen*, v. 3, Mar. 1957, p. 127-132.

Description of diffraction-grating spectrometer. Advantages of grating for photo-electric measurements. Adjustment of the optical system. Principles and precision of measurement. Installation of the unit in a steel mill. Spectral lines used. Samples of calibration curves for steels and Al alloys.

9608* (German.) Development Possibilities of Photoelastic Emission-Spectral Analysis. **Entwicklungsmöglichkeiten der lichtelektrischen Emissions-Spektralanalyse.** Hans Krempl and Günter Scheibe. *Archiv für das Eisenhüttenwesen*, v. 3, Mar. 1957, p. 135-143.

Equipment, operation, and applications. Problems.

9609* A Modified Ninhydrin Colorimetric Analysis for Amino Acids. Hyman Rosen. *Archives of Biochemistry and Biophysics*, v. 67, Mar. 1957, p. 10-15.

Method does not require the prior preparation of an unstable ninhydrin reagent.

9610* (English.) **Separation of *cis-trans* Isomers by Ion-Exchange Chromatography. 4 - Chloro - *cis* - Cinnamic Acid and 2,4-Dichloro-*cis*-Cinnamic Acid.** Sven Lindenfors. *Arkiv för Kemi*, v. 10, no. 6, 1957, p. 561-568.

9611* (English.) **Quantitative Estimation of Sialic Acids. I. A Colorimetric Method With Orcinol-Hydrochloric Acid (Bial's) Reagent.** Lars Svennerholm. *Arkiv för Kemi*, v. 10, no. 6, 1957, p. 577-596.

9612* The Separation of Sugars on Carbon Columns by Gradient Elution. M. A. Jermyn. *Australian Journal of Chemistry*, v. 10, Feb. 1957, p. 55-78.

9613* (Dutch.) Physical Gas-Analysis Apparatus for Industry. **Fysische gasanalyse-apparaten voor de industrie.** R. Smit. *Bedrijf en Techniek*, v. 12, no. 276; *Electronica Section*, v. 10, no. 223, Apr. 6, 1957, p. 49-53.

Usefulness and difficulties of physical analytical methods. Quantities that can be analyzed. Infra-red analysis. Paramagnetic measurement of O. Mass spectrography.

9614 Chromatography of Waste Sulphite Liquor. A. C. Shaw and M. Dignam. *Canadian Journal of Chemistry*, v. 35, Apr. 1957, p. 322-332.

A series of chromatographically homogeneous phenolic compounds, which appear to be lignin sulfonate fragments were separated. Xylose, arabinose, galactose, and rhamnose were isolated and identified by preparation of solid derivatives.

9615 Applications of X-Ray Emission Spectrometry to Rock and Ore Analysis. G. R. Webber. *Canadian Mining and Metallurgical Bulletin*, v. 50, Apr. 1957, p. 222-227.

Includes sample results from analyses for Nb, Fe, Ca, Ti, and K.

9616* (French.) Determining Sodium, Potassium, and Calcium by Flame Spectrophotometry. **La détermination du sodium, potassium et calcium par spectrophotométrie de flamme.** T. Samuel. *Centre Belge d'Etude et de Documentation des Eaux, Bulletin Mensuel*, no. 74, Feb. 1957, p. 66-69.

Field of application; method used; description of apparatus; measuring techniques; effect of cations on the emission of the analyzed cation, and of anions on the emission of the analyzed cation.

9617* (English.) **The Separation of α-Glycerophosphoric Acid From Its β-Isomer by Paper Chromatography.** Chieko Urakami and Yoshiko Kakutani. *Chemical Society of Japan, Bulletin*, v. 30, Jan. 1957, p. 21-25.

9618* (English.) **Studies on Organic Reagents for Inorganic Analysis. I. Phenylfluorone as Sensitive Reagent for Colorimetric Determination of Zirconium.** Kenjiro Kimura and Hirotoshi Sano. *Chemical Society of Japan, Bulletin*, v. 30, Jan. 1957, p. 80-83.

9619 The Separation of the Lanthanons With the Aid of Ethylenediamine-Tetra-Acetic Acid("Enta Acid"). VI. Ion-Exchange Studies of the Heavy and Middle Lanthanons and Yttrium. J. K. Marsh. *Chemical Society, Journal,* Mar. 1957, p. 978-982.

9620* (German.) The Separation and Identification of Saturated and Unsaturated Fatty Acids From Formic Acid to Dodecanoic Acid by Gas-Liquid Chromatography. **Trennung und Identifizierung gesättigter und ungesättigter Fettsäuren von der Ameisen- bis zur Dodecansäure mit Hilfe der Gas-Chromatographie.** A. T. James. *Fette, Seifen, Anstrichmittel,* v. 59, Feb. 1957, p. 73-77.

9621 A Radiochemical Separation for Cobalt-60 in Aqueous Waste Solutions. R. A. Schneider. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission),* HW-47896, Jan. 1957, 26 p. (UF767 Un3.1hw Contin.)

Cobalt-60 is carried from solution as a mixture of insoluble cobaltous and ferrous cobalticyanides after the cobaltic ammine complexes have been destroyed by reduction and acid deammonation .

9622 Spectrochemical Analysis of Water. R. Ko. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission),* HW-48770, Jan. 1957, 11 p. (UF767 Un3.1hw Contin.)

An evaporation-spectrographic method was applied to the determination of traces of Fe, Ni, Cr, Zr, Ca, Mg, Cu, Al, Zn, Pb, Co, and Mn in high-purity water. Sample is concentrated by evaporation with In as the internal standard. Residue is analyzed by a graphite spark technique using flat top electrodes with a precision of ± 10%.

9623 (French.) (p-Azophenyl-Phenyl)-4-Semicarbazide as Used in Analytical Chemistry. **La (p-azophényl-phényl)-4-semicarbazide et son emploi en chimie analytique.** M. Winter, E. Demole, and E. Sundt. *Helvetica Chimica Acta,* v. 40, no. 2, 1957, p. 467-476.

Preparation and analytical use of 4-(p-phenylayophenyl)-semicarbazones.

9624 (French.) Some Analytical Properties of Oxaldihydroxamic Acid. **Quelques propriétés analytiques de l'acide oxaldihydroxamique.** D. Monnier and C. Jegge. *Helvetica Chimica Acta,* v. 40, no. 2, 1957, p. 513-526.

The probable formula of solid oxaldihydroxamic acid was obtained by the infra-red method. The acid-base constants were determined by the pH measurement. The formation of complexes 1 Fe + 1 acid and 2 Fe + 1 acid was shown by means of Fe(III).

9625* Carrier-Free Separation of Sn^{113} From Indium. K. S. Bhatki and P. Radhakrishna. *Indian Academy of Sciences, Proceedings,* v. 45, sec. A, Jan. 1957, p. 30-34.

Procedure for separation from deuteron-bombarded In depends on the extraction of stannic cupferrate from mineral acid solution using CCl_4, followed by ignition of the complex.

9626* A New Spectrophotometric Method for the Determination of Copper With Sodium Versenate. N. A. Ramaiah and Vishnu. *Indian Academy of Sciences, Proceedings,* v. 45, sec. A, Feb. 1957, p. 113-116.

9627* Infrared Absorption Spectrum of Sodium Citrate. B. R. Lakshmanan. *Indian Institute of Science, Journal,* v. 39, sec. A, Jan. 1957, p. 27-29.

9628* Infrared Absorption Spectra of Copper Potassium Oxalate, Copper Sodium Oxalate and Copper Ammonium Oxalate. B. R. Lakshmanan. *Indian Institute of Science, Journal,* v. 39, sec. A, Jan. 1957, p. 30-33.

9629* (English.) **Titrations in Non-Aqueous Solvents. I. Acid-Base Theories.** R. Van Poucke. *Industrie Chimique Belge,* v. 22, Mar. 1957, p. 271-283.

A summary of the more recent methods generally used in non-aqueous titration. The principles of the acid-base theories are explained. (To be continued.)

9630* Improving the Infrared Gas Analyzer. Max D. Liston, Anthony J. Andreatch, and Cedric Beebe. *ISA Journal,* v. 4, Apr. 1957, p. 118-123.

New non-dispersive, positive-type analyzer uses a differential principle to compensate for sample-cell corrosion and dirt, and for overlapping spectra.

9631* (English.) **Studies on the Oxidative Decomposition of Urocanic Acid. IV. Isolation of Hydantoin Acrylic Acid and Other Intermediates.** Katashi Ichihara, Hitoshi Satani, Naotada Okada, Yasuyuki Takagi, and Yukiya Sakamoto. *Japan Academy, Proceedings,* v. 33, Feb. 1957, p. 105-110.

9632 Infra-Red Spectroscopy as a Quantitative Analytical Method in General Chemicals Manufacture. J. C. Hawkes. *Journal of Applied Chemistry,* v. 7, Mar. 1957, p. 123-130.

Application to the analysis of the crude products obtained in the manufacture of organic substances, with special reference to the chlorination products of phenol and the preparation of 2:4-dichlorophenoxyacetic acid and of *p*-phenetidine.

9633* The Determination of Phosphorus and Phosphatase With *N*-Phenyl-*p*-Phenylendiamine. R. L. Dryer, A. R. Tammes, and Joseph I. Routh. *Journal of Biological Chemistry,* v. 225, Mar. 1957, p. 177-183.

9634 (French.) Polarographic Analysis of Complex Calamines. Determining Iron, Lead, Zinc, Manganese, Arsenic, and Antimony. **Analyse polarographique de calamines complexes. Dosages du fer, plomb, zinc, manganèse, arsenic et antimoine.** Sanaa E. Khalafalla and Michel Y. Farah. *Journal de Chimie Physique,* v. 54, Mar. 1957, p. 251-257.

For determining Fe, Zn, and Pb, an electrolytic support made of HNO_3 and KCl was used. Traces of As and Sb were detected and determined. The best reagent for determining Mn is cyanide.

9635 Infra-Red Spectra of Inorganic Solids. I. Peroxides, Peroxide Hydrates, and Superoxides. Edward G. Brame Jr., Sheldon Cohen, John L. Margrave, and Villiers W. Meloche. *Journal of Inorganic and Nuclear Chemistry,* v. 4, Mar. 1957, p. 90-92.

A special "sandwich" modification of the KBr disc technique was developed.

9636 Electron Probe Microanalyzer and Its Application to Ferrous Metallurgy. R. Castaing, J. Philibert, and C. Crussard. *Journal of Metals,* v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions,* v. 209, Apr. 1957, p. 389-394.

Apparatus can be used to carry out local analyses of non-conductors as well as metals or alloys of one or more phases, to measure all the variations of composition within one phase such as a segregate, and to find the composition of non-metallic inclusions, sulfides, carbides, and oxides formed by internal or surface oxidation.

9637 Effects of Hydrogen Content on the Resistance and the Potential in the Palladium - Hydrogen - Acid System. James P. Hoare and Sigmund Schuldiner. *Journal of Physical Chemistry,* v. 61, Apr. 1957, p. 399-402.

Hydrogen dissolved in Pd was determined by relative resistance measurements, coulometric determinations, and by reduction with ceric ion

9638 Solid State Anomalies in Infrared Spectroscopy. Alvin W. Baker. *Journal of Physical Chemistry,* v. 61, Apr. 1957, p. 450-458.

Variations between mull and pellet spectra of organic compounds are due either to an induced physical isomerization or to the samples having been rendered amorphous in the pellet.

9639 Quantitative Determinations of Amino-Acids in Undesalted Hydrolysates by Buffer Filter-Paper Chromatography. B. E. Baker and N. A. Khan. *Journal of the Science of Food and Agriculture,* v. 8, Apr. 1957, p. 217-222.

9640 The Determination of Cobalt in Ferrous Alloys Using a Chromatographic Separation. D. G. Stern. *Metallurgia,* v. 55, Apr. 1957, p. 207-208.

The ferrous alloy is dissolved in HCl and oxidized with H_2O_2 prior to separation of the Co from interfering elements chromatographically. 1-Nitroso-2-naphthol is used for the final precipitation.

9641* (Italian.) Electrolysis at Controlled Potential in the Analysis of Leading Copper Alloys. **L'elettrolisi a potenziale controllato nell' analisi delle principali leghe di rame.** B. Alfonsi. *Metallurgia Italiana,* v. 49, Feb. 1957, p. 89-94.

Method is useful for successive determinations of Cu, Pb, Sn, and Sb. Its application to analysis of bronzes, brasses, Sn-base alloys, and Babbitt metals is described.

9642* (German.) IR Spectra of Isocyanates and Substituted Ureas. **IR-Spektren von Isocyanaten und Substituierten Harnstoffen.** J. Derkosch, K. Schlögl, and W. Woidich. *Monatshefte für Chemie*, v. 88, Feb. 1957, p. 35-46.

9643 A Method for the Determination of Radium in Ores and Residues. J. E. Hudgens, R. C. Meyer, C. Zyskowski, and L. C. Nelson. *New Brunswick Laboratory (U. S. Atomic Energy Commission)*, NBL-128, Mar. 1957, 19 p. (UF767 Un3.1nb Contin.)

Method uses a "4π" high pressure, ionization chamber to compare the γ activity of the sample with a standard amount of Ra, each being in equilibrium with its decay products.

9644 Separation of Americium and Promethium. R. S. Pressly. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2202, Mar. 1957, 3 p. (UF767 U3o Contin.)

Promethium and Am are coprecipitated as fluorides, dissolved in boric acid and HNO_3, and the solution made 3 M in H_2SiF_6. Upon heating and slow digestion, PmF_3 precipitates while Am remains complexed in solution.

9645 The Photometric Determination of Molybdenum in Zinc Cyanide Plating Solutions. J. P. Leftin. *Plating*, v. 44, Apr. 1957, p. 380-382.

Modified thiocyanate-stannous chloride procedure, using butyl carbitol to stabilize the color, effects a time saving of 15 min. per determination.

9646 The Determination of Copper in Nickel Solutions. Thomas A. Downey. *Plating*, v. 44, Apr. 1957, p. 383-385.

Procedure is based on the formation of a yellow colored complex produced by the interaction of cuprous Cu and neocuproine (2-9 dimethyl 1-10 phenanthroline). This complex is extracted into $CHCl_3$ and the absorbancy determined.

9647 Simultaneous Analyses by an Ion Exchange Method of Phosphates, Sulphates and Chlorides. Inga Behr. *Research Council of Israel, Bulletin*, v. 5A, July 1956, p. 259-262.

Method consists of a series of titrations on solutions containing various amounts of the anions, after their passage through an ion exchange column filled with resin Amberlite IR-120.

9648* (Spanish.) Basic Principles of Stereochemical Conformation Analysis. **Ideas fundamentales de análisis conformacional.** Carlos A. Dávila. *Revista de Ciencia Aplicada*, v. 11, Jan.-Feb. 1957, p. 15-24.

Fundamentals of conformation analysis and application to examination of bodies whose molecules contain rings similar to the cyclohexane rings.

9649* Gas Chromatography. John H. Knox. *Science Progress*, v. 45, Apr. 1957, p. 227-244.

A general review of equipment and techniques.

9650* (English.) **Sample Transport and Temperature Studies in Porous-Cup Discharges.** Cyrus Feldman and Margaret K. Wittels. *Spectrochimica Acta*, v. 9, Mar. 1957, p. 19-39 + 2 plates.

Thermal equilibrium exists in porous-cup discharges excited by d.c. pulses approximately 600 to 900μ sec. in duration and 5 to 10 amps. in peak-height. A technique is described for measuring the mean hydroxyl rotational temperatures of such discharges using a spectrograph of 2.5 A. per mm. dispersion.

9651* (English.) **Infra-Red Spectra of $GeCl_4$, $GeHCl_3$, and $GeDCl_3$.** L. P. Lindeman and M. Kent Wilson. *Spectrochimica Acta*, v. 9, Mar. 1957, p. 47-50.

9652* (English.) **Infra-Red Absorption Spectra of Inorganic Co-Ordination Complexes. IX. Infra-Red Spectra of Oxalato Complexes.** M. Judith Schmelz, Tatsuo Miyazawa, San-Ichiro Mizushima, T. J. Lane, and J. V. Quagliano. *Spectrochimica Acta*, v. 9, Mar. 1957, p. 51-58.

Spectra of oxalato complexes of Fe(III), Co(III), Cr(III), Al(III), Pd(II), and Cu(II) were measured in the NaCl and CsBr regions.

9653* (English.) **Excitation Temperatures in Spark Discharges.** C. M. Cundall and J. D. Craggs. *Spectrochimica Acta*, v. 9, Mar. 1957, p. 68-88.

Data for Zn, Cd, Mg, and W electrodes.

9654* (Russian.) Iodometric Determination of Silicon. **Iodometricheskoe opredelenie kremniia.** R. M. Veitsman. *Zavodskaia Laboratoriia*, v. 23, no. 2, 1957, p. 153-157.

Theoretical basis for the process and method of performing the analysis. A comparison of volumetric, colorimetric titration, and photocolorimetric methods.

9655* (English.) **Volumetric Estimation of Arsenite With Potassium Permanganate and Ceric Sulphate. Iodine Monochloride Catalysis in Sulphuric Acid Medium.** K. Bhaskara Rao and G. Gopala Rao. *Zeitschrift für Analytische Chemie*, v. 155, no. 3, 1957, p. 161-165.

Conditions were developed for the estimation by direct titration with $KMnO_4$ in sulphuric acid medium, using 0.005*M* ICl as catalyst. The end point in these titrations is more stable than in titrations in HCl medium.

9656* (English.) **Use of Organic Reagents in Inorganic Analysis. IV. Determination of Palladium and Uranium With 1-Nitroso-2-Hydroxy-3-Naphthoic Acid.** Sachindra Kumar Datta. *Zeitschrift für Analytische Chemie*, v. 155, no. 4, 1957, p. 241-250.

The pH ranges for the complete precipitation of Pd and U with this reagent are from 2.6 to 4.8 and from 3.4 to 4.5 respectively.

9657* (German.) Photometric Analysis of Carbon Monoxide in the Air. **Photometrische Bestimmung von Kohlenmonoxyd in der Luft.** Gheorghe Ciuhandu. *Zeitschrift für Analytische Chemie*, v. 155, no. 5, 1957, p. 321-327.

A photometric process on determining CO, based on the absorption of gas in an alkali solution of the Ag compound of p-sulfanylbenzoic acid. The Ag compound is reduced to Ag metal. Readings are taken in a short-wave light using a Zeiss filter.

9658* (German.) Quantitative Determination of K, Na, and Ca Through Their Nitrite Complexes. **Zur quantitativen Bestimmung von Kalium, Natrium und Calcium mittels ihrer Nitritkomplexe.** H. Zimmer. *Zeitschrift für Analytische Chemie*, v. 155, no. 5, 1957, p. 337-340.

See also: **9426** (fertilizer analysis); **9427** (pesticide analysis); **9460** (analytical clinical chemistry); **9461** (analysis of pharmaceuticals and drugs); **9462** (analysis of peptides and proteins); **9471** (analysis of muscle tissue); **9529** (extraction of fission products); **9659** (precipitation of uranium orthophosphate); **9898** (organic coatings analysis); **10149** (analysis of foods); **10154** (analysis of vanilla extracts); **10157** (fuel analysis); **10202** (pigment identification methods); **10254** (analysis of lubricating oil); **10737** (molecular spectroscopy); **10771** (analysis of isocyanate foams); **10829** (determination of toluene-diisocyanates); **10841** (analysis of rubbers).

CHEMISTRY—INORGANIC AND GENERAL

9659* (English.) **An Investigation of Conditions for Precipitation of Uranium (IV) Orthophosphate.** Erik Strandell. *Acta Chemica Scandinavica*, v. 11, no. 1, 1957, p. 105-119.

Precipitation from low concentrated acid solutions depends greatly on the presence of Al salts in the solutions.

9660* (English.) **The Acidity Function in Solutions of Hydrogen Chloride in Methanol-Water Mixtures.** Pentti Salomaa. *Acta Chemica Scandinavica*, v. 11, no. 1, 1957, p. 125-131.

Values of Hammett's acidity function H_0 for solutions of HCl in water and methanol and in their binary mixtures were measured spectrophotometrically for the concentration range from 0.08 to 0.8 N.

9661* (French.) Tritium. **Le tritium.** Daniel Blanc. *Âge Nucléaire*, no. 3, Mar.-Apr. 1957, p. 34-39.

Mechanics of the formation and concentration of tritium in the various regions of the world where it is found.

9662 The Preparation and Properties of Complex Fluoroarsenates. H. M. Dess and R. W. Parry. *American Chemical Society, Journal*, v. 79, Apr. 5, 1957, p. 1589-1591.

Synthesis of ammonium and Cs hexafluoroarsenates and hexafluoroarsenic acid.

9663 The Apparent Molar Refraction of Lanthanum Perchlorate in Aqueous Solution. John E. Roberts and Norman W. Silcox. *American Chemical Society, Journal*, v. 79, Apr. 20, 1957, p. 1789-1792.

Dispersion, volume, and the partial molal volume were also determined.

9664 The Heat Capacities and Thermodynamic Properties of Crystalline and Vitreous Anhydrous Sodium Tetraborate From 6 to 350°K. Edgar F. Westrum, Jr. and George Grenier. *American Chemical Society, Journal*, v. 79, Apr. 20, 1957, p. 1799-1802.

Determined from 6 to 350 K by adiabatic calorimetry; heat capacity and the derived thermodynamic functions are computed and tabulated.

9665 The Reduction of Sulfate to Sulfide in Acid Solutions by Divalent Chromium. Hosmer W. Stone and James L. Forstner. *American Chemical Society, Journal*, v. 79, Apr. 20, 1957, p. 1840-1843.

The slow reaction is catalyzed by certain halides and by phosphate.

9666 The Kinetics of the Reaction of Fluorine With Iodine Pentafluoride to Form Iodine Heptafluoride. Jack Fischer and Robert K. Steunenberg. *American Chemical Society, Journal*, v. 79, Apr. 20, 1957, p. 1876-1878.

From 55 to 95 C the rate of the reaction was found to be second order with respect to the reactant pressures.

9667 The Imine Radical. Francis Owen Rice and Chester Grelecki. *American Chemical Society, Journal*, v. 79, Apr. 20, 1957, p. 1880-1881.

Study of the decomposition of hydrazoic acid passed through a quartz furnace at about 1000 C and 0.1 mm. pressure and condensed on a cold finger.

9668 Vapor-Liquid Equilibria of Nitrogen-Argon-Oxygen Mixtures. R. E. Latimer. *A.I.Ch.E., Journal*, v. 3, Mar. 1957, p. 75-82.

9669* (English.) **The Complex Formation Between Thallium(I) Ions and Halide, Thiocyanate, and Cyanide Ions.** Rolf O. Nilsson. *Arkiv för Kemi*, v. 10, no. 4, 1957, p. 363-381.

9670 Experiments on the Preparation of UO_2-x and UO. Dale A. Vaughan, Carl W. Melton, and Arnold F. Gerds. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-1175, Mar. 1957, 10 p. (UF767 U3b Contin.)

Reactions designed to reduce the O content of UO_2 below stoichiometric composition are described. The reaction of UC with UO_2 is capable of producing a single-phase material of composition UC_xO_{1-x} (x=0.5) by heating in vacuum at 1600 to 1800 C.

9671* (English.) **Structure of Erdmann's Salt, $NH_4Co(NH_3)_2(NO_2)_4$, and Some Other Related Nitro-Ammine-Cobalt (III) Complexes.** Yoshimichi Komiyama. *Chemical Society of Japan, Bulletin*, v. 30, Jan. 1957, p. 13-21.

9672 Polonium Monosulphide. K. W. Bagnall and D. S. Robertson. *Chemical Society, Journal*, Mar. 1957, p. 1044-1046.

Polonium monosulfide was prepared on the milligram scale; its decomposition under vacuum was used as the basis of a new method for the preparation of pure Po metal.

9673* (French.) Uranium Polysulfide. **Sur le polysulfure d'uranium.** Marius Picon and Jean Flahaut. *Comptes Rendus*, v. 244, Mar. 25, 1957, p. 1777-1779.

S_3U obtained by the action of S at 600 C on S_2U in a vacuum sealed tube possesses a nonoclinic unit cell. It dissociates at a low temperature and slowly oxidizes at room temperature.

9674* The Encyclopedia of Chemistry. George L. Clark and Gessner G. Hawley, editors. 1037 p. 1957. Reinhold Publishing Corp., New York. (QD5 C54e)

An authoritative and up-to-date compilation of information designed for the needs of chemists, engineers, and scientific workers in all fields.

9675* Preparation of Pure U_3O_8 From Crude Sodium Diuranate by Intermediate Complex Formation. N. S. Krishnaprasad and V. V. Dadape. *Indian Academy of Sciences, Proceedings*, v. 45, sec. A, Jan. 1957, p. 20-23.

9676 Titrimetry in the Study of Inorganic Reactions in Non-Aqueous Solvents. Orland W. Kolling. *Journal of Chemical Education*, v. 34, Apr. 1957, p. 170-173.

Method is particularly valuable in acetic acid and liquid ammonia.

9677 The Crystal Structure of Gallium Dichloride. G. Garton and H. M. Powell. *Journal of Inorganic and Nuclear Chemistry*, v. 4, Mar. 1957, p. 84-89.

Consists of tetrahedral $[GaCl_4]^-$ ions and Ga^+ ions. Fourier's syntheses are presented.

9678 A Comparative Study of Polyol Complexes of Arsenite, Borate, and Tellurate Ions. G. L. Roy, A. L. Laferriere, and John O. Edwards. *Journal of Inorganic and Nuclear Chemistry*, v. 4, Mar. 1957, p. 106-114.

The constants obtained for arsenite and borate ions correlate well, but values for tellurate complexes do not agree.

9679 Hydrothermal Reactions Between Calcium Hydroxide and Amorphous Silica; the Reactions Between 180 and 220°. Gunnar O. Assarsson. *Journal of Physical Chemistry*, v. 61, Apr. 1957, p. 473-479.

Three stages of the reaction are distinguished; a new distinct compound of 0-1 mole CaO per mole silica is reported.

9680* The Preparation of Anhydrous Thorium Tetrachloride. O. C. Dean and J. M. Chandler. *Nuclear Science and Engineering*, v. 2, Feb. 1957, p. 57-72.

The dry chlorination of the oxide, oxalate, carbonate, carbides, sulfides, and nitrate with various chlorinating agents was evaluated. Chlorination of the oxide, oxalate, and carbonate in the presence of carbon and direct chlorination of the carbide with chlorine appear to be the most promising methods.

9681* The Chemistry of Polonium. K. W. Bagnall. *Quarterly Reviews*, v. 11, no. 1, 1957, p. 30-48 + 4 plates.

Separation; handling; characteristics of the metal and its compounds; chemical reactions; uses.

9682* Some General Aspects of the Inorganic Chemistry of Fluorine. A. G. Sharpe. *Quarterly Reviews*, v. 11, no. 1, 1957, p. 49-60.

The principal properties which confer on F its remarkable chemical behavior are the smallness of the F atom and the F ion, the restriction to an octet of electrons, and the weakness of the bond in the F_2 molecule.

9683* (German.) Acids of Sulfur. **Über Säuren des Schwefels. I.** Study of Water-Free Thiosulfuric Acid. **Zur Kenntnis der wasserfreien Thioschwefelsäure. II.** Study of a New Group of Sulfuric Acids. **Zur Kenntnis einer neuen Klasse von Schwefelsäuren. III.** Water-Free Polythio Acids (Sulfuric-Disulfonic Acids): $H_2S_2O_6$, $H_2S_4O_6$, $H_2S_5O_6$, $H_2S_6O_6$, and $H_2S_7O_6$. Preparation of Octathio-, Decathio-, and Dodecathio-Acid Solutions and Salts. **Zur Kenntnis der wasserfreien Polythionsäuren (Sulfan-Disulfonsäuren) $H_2S_2O_6$, $H_2S_4O_6$, $H_2S_5O_6$, $H_2S_6O_6$ und $H_2S_7O_6$. Darstellung von Lösungen und Salzen der Octathionsäure, Dekathionsäure und Dodekathionsäure. IV.** Relation Between the Groups: H_2S_x, $H_2S_xO_3$, and $H_2S_xO_6$. **Zusammenhänge zwischen den Stoffklassen H_2S_x, $H_2S_xO_3$ und $H_2S_xO_6$.** Max Schmidt. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 289, Feb. 1957, p. 141-202.

Iodine is used extensively both in synthesis and analysis of this series of compounds.

9684* (English.) **The Redox Equilibrium in Iron Oxide Spinels and Related Systems.** H. Flood and D. G. Hill. *Zeitschrift für Elektrochemie*, v. 61, no. 1, 1957, p. 18-24.

9685 (Russian.) Preparing Thorium Sulfides and Determining Some of Their Properties. **Prigotovlenie i nekotorye osobennosti sul'fidov toriia.** G. V. Samsonov and M. N. Popova. *Zhurnal Obshchei Khimii*, v. 27, Jan. 1957, p. 3-9.

Producing Th sulfides by direct combination of Th and S. ThS and Th_2S_3 are the most stable phases in the Th-S system. Determination of melting points and microhardness.

9686 (Russian.) The Condition of Borates in Aqueous Solution. **K voprosu o sostoianii boratov v vodnom rastvore.** E. M. Shvarts and S. G. Vimba. *Zhurnal Obshchei Khimii*, v. 27, Jan. 1957, p. 23-29.

A study of the electric conductivity and lowering of the freezing point of weak solutions of borates in water and 3% boric acid, in order to determine the composition of the borates. The monoborate ion is stable in aqueous solution.

CHEMISTRY—ORGANIC

9687 Correlation of Solvolysis Rates. V. α-Phenylethyl Chloride. VI. *t*-Butyl and α-Phenylethyl Bromides. VII. Neophyl Chloride and Bromide. Arnold H. Fainberg and S. Winstein. *American Chemical Society, Journal*, v. 79, Apr. 5, 1957, p. 1597-1612.

9688 Mechanisms of Elimination Reactions. Sulfur Isotope Effects in the Decomposition of Some Sulfonium Salts. William H. Saunders, Jr. and Smiljko Asperger. *American Chemical Society, Journal*, v. 79, Apr. 5, 1957, p. 1612-1615.

The $^{32}S/^{34}S$ effect for *t*-butyldimethylsulfonium iodide is approximately 1.8% in water.

9689 Alkylpyridines. Extension of the Sodamide-Liquid Ammonia Alkylation Method. H. L. Lochte and Tom H. Cheavens. *American Chemical Society, Journal*, v. 79, Apr. 5, 1957, p. 1667-1669.

Methyl iodide alkylation is used for the synthesis of 2-ethyl-3-methyl-, 4-ethyl-2-methyl-, 2-methyl-4 (2-propyl)-, 2-ethyl-5-methyl-, and 2-ethyl-6-methyl-pyridine.

9690 Some Displacement Reactions of 4,7-Dichloro-1-Methylquinolinium Ion. R. U. Schock. *American Chemical Society, Journal*, v. 79, Apr. 5, 1957, p. 1670-1672.

Hydrolysis of 4,7-dichloroquinoline methosulfate with aqueous alkali produces a mixture of 4,7-dichloro-1-methyl-2-quinolone and 7-chloro-1-methyl-4-quinolone.

9691 Derivatives of Heteroauxin. II. Some Substituted 2-Methyl-3-Indoleacetic Acids. Frank J. Stevens, Eugene C. Ashby, and William E. Downey. *American Chemical Society, Journal*, v. 79, Apr. 5, 1957, p. 1680-1682.

Acids substituted in the 5- or 4,5-positions and some of their derivatives are described.

9692 The Stereochemistry of Raney Nickel Action. VIII. Carbon-Carbon Bond Hydrogenolyses Catalyzed by Raney Nickel. John A. Zderic, William A. Bonner, and Thomas W. Greenlee. *American Chemical Society, Journal*, v. 79, Apr. 5, 1957, p. 1696-1698.

With Raney nickel in refluxing ethanol, 2-phenyl-1,2-propanediol yielded primarily ethylbenzene instead of the anticipated 2-phenyl-1-propanol.

9693 Condensed Cyclobutane Aromatic Systems. II. Dihalo Derivatives of Benzocyclobutene and Benzocyclobutadiene Dimer. M. P. Cava and D. R. Napier. **III. The Dehydrobromination of 1,2-Dibromobenzocyclobutene.** M. P. Cava and J. F. Stucker. *American Chemical Society, Journal*, v. 79, Apr. 5, 1957, p. 1701-1709.

9694 The Reaction of Dinitrogen Tetroxide With Acetylenes. Jeremiah P. Freeman and William D. Emmons. *American Chemical Society, Journal*, v. 79, Apr. 5, 1957, p. 1712-1716.

The corresponding *cis*- and *trans*-dinitroölefins, an α-diketone, and an, α,α-dinitroketone were isolated.

9695 The Addition of Alcohols to Octafluoroisobutene. Robert J. Koshar, Thomas C. Simmons, and Friedrich W. Hoffmann. *American Chemical Society, Journal*, v. 79, Apr. 5, 1957, p. 1741-1744.

The aliphatic alcohols employed, with the exception of methanol, also yielded considerable amounts of vinyl ethers.

9696 The Synthesis of 9-Methyl-3,4-Benzpyrene and 8,9-Dimethyl-3,4-Benzpyrene. Jules L. Adelfang and Guido H. Daub. *American Chemical Society, Journal*, v. 79, Apr. 5, 1957, p. 1751-1754.

9697 The Preparation of Some Vinylpiperidines. H. L. Cohen and L. M. Minsk. *American Chemical Society, Journal*, v. 79, Apr. 5, 1957, p. 1759-1762.

None of these compounds could be homopolymerized by the usual methods.

9698 The Preparation and Properties of Crystalline Lithium Alkyls. Theodore L. Brown and Max T. Rogers. *American Chemical Society, Journal*, v. 79, Apr. 20, 1957, p. 1859-1861.

Methyllithium of about 95% purity, used in this study, was prepared by reaction of ethyllithium with methyl iodide in benzene at 5 to 10 C.

9699 Rates of Solvolysis of the Alkylphenyldimethylcarbinyl Chlorides. Evidence for the Importance of Carbon-to-Carbon Hyperconjugative Contributions in Alkyl Groups. Herbert C. Brown, James D. Brady, Martin Grayson, and W. Hallam Bonner. *American Chemical Society, Journal*, v. 79, Apr. 20, 1957, p. 1897-1903.

Phenyldimethylcarbinol and its *o*-, *m*-, and *p*-monoalkyl (methyl, ethyl, isopropyl, and *t*-butyl) derivatives were synthesized.

9700 Rates of Solvolysis of α- and β-Naphthyldimethyl- and -monomethylcarbinyl Chlorides. Steric and Electronic Effects of the Naphthalene System. Y. Okamoto and Herbert C. Brown. *American Chemical Society, Journal*, v. 79, Apr. 20, 1957, p. 1903-1905.

9701 Rates of Solvolysis of the Halophenyldimethylcarbinyl Chlorides. The Effect of Halogen Substituents Upon the Rates of Electrophilic Reactions. Herbert C. Brown, Y. Okamoto, and George Ham. *American Chemical Society, Journal*, v. 79, Apr. 20, 1957, p. 1906-1909.

Twelve *o*-, *m*-, and *p*-monohalophenyldimethylcarbinyl chlorides were synthesized and their rates of solvolysis in 90% aqueous acetone determined at several temperatures.

9702 Rates of Solvolysis of the Nitro- and the Methoxyphenyl-Dimethylcarbinyl Chlorides. Y. Okamoto and Herbert C. Brown. *American Chemical Society, Journal*, v. 79, Apr. 20, 1957, p. 1909-1912.

The *m*-methoxy derivative reacts at a rate 0.6 that of the parent compound but the *para* derivative at a rate of 3360 that of the unsubstituted derivative.

9703 Substituent Constants for Aromatic Substitution. Herbert C. Brown and Y. Okamoto. *American Chemical Society, Journal*, v. 79, Apr. 20, 1957, p. 1913-1917.

Reveals an excellent correlation in the case of the *meta* derivatives but serious deviations for the *para* substituents.

9704 Peroxides. IV. Aliphatic Diperacids. Winfred E. Parker, L. P. Witnauer, and Daniel Swern. *American Chemical Society, Journal*, v. 79, Apr. 20, 1957, p. 1929-1931.

A series of peroxides, the C_8-C_{10} C_{12}, and C_{18} α, ω-diperacids, were prepared in high yield from dibasic acids and 65% aqueous H_2O_2.

9705 Some α-Alkoxyarylacetic Acids. Wilkins Reeve and Paul E. Pickert. *American Chemical Society, Journal*, v. 79, Apr. 20, 1957, p. 1932-1934.

Preparation and compounds are described with a summary of their physiological activity in plants.

9706 The Addition of *t*-Butylmagnesium Chloride to 2,2-Diphenyl-1-Acenaphthenone. Reynold C. Fuson and Gary W. Griffin. *American Chemical Society, Journal*, v. 79, Apr. 20, 1957, p. 1941-1945.

Condenses in the 1,6-manner to yield a dihydroaromatic derivative; other reactions are studied.

9707 Toxic Fluorine Compounds. XIV. Some ω-Fluoroalkyl Nitrogen Compounds. G. J. O'Neill and F. L. M. Pattison. **XV. Some ω-Fluoro-β-Ketoesters and ω-Fluoroketones.** R. R. Fraser, J. E. Millington, and F. L. M. Pattison. *American Chemical Society, Journal*, v. 79, Apr. 20, 1957, p. 1956-1961.

9708 The Iron Catalysis of Thioglycolate Oxidation by Oxygen. Hildegard Lamfrom and Sigurd Olaf Nielsen. *American Chemical Society, Journal*, v. 79, Apr. 20, 1957, p. 1966-1970.

The rate of anaerobic bleaching of red ferric thioglycolate was measured spectrophotometrically and shown to follow second-order kinetics.

9709 The Synthesis of Di- and Terthienyls. Hans Wynberg, A. Logothetis, and D. VerPloeg. *American Chemical Society, Journal*, v. 79, Apr. 20, 1957, p. 1972-1975.

Method was found useful for the synthesis of some simple 3-substituted thiophenes.

9710 A Total Synthesis of Estrone and 14-Isoestrone. William S. Johnson, Robert G. Christiansen, and Robert E. Ireland. *American Chemical Society, Journal*, v. 79, Apr. 20, 1957, p. 1995-2005.

9711 Phase Behavior of Fatty Acids-Chlorinated Solvent Systems. George W. Preckshot and F. J. Nouri. *American Oil Chemists' Society, Journal*, v. 34, Apr. 1957, p. 151-155.

Solubility isotherms for the binary mixtures of palmitic and oleic acids in ethylene dichloride and CCl_4 and stearic and oleic acids in ethylene dichloride and trichloroethylene. Solubilities of palmitic, stearic, and oleic acids in each of ethylene dichloride, trichloroethylene, and CCl_4.

9712 Synthetic Detergent Symposium. *American Oil Chemists' Society, Journal*, v. 34, Apr. 1957, p. 170-216.

Twelve papers dealing with the development, properties, and uses of the various types of detergents. Also includes analytical test methods.

9713 Preparation of New Derivatives of Anisic Acid. Seymour Liberman and Frank W. Bope. *American Pharmaceutical Association, Journal (Scientific Ed.)*, v. 46, Apr. 1957, p. 234-236.

Synthesis of five new esters. Pharmacological tests indicate local anesthetic properties.

9714* (English.) **Stereochemical Studies in the α-Aryl Carboxylic Acid Series With Special Reference to Phenyl- and 2-Thienyl-Substituted Compounds.** Kurt Pettersson. *Arkiv för Kemi*, v. 10, no. 4, 1957, p. 297-323.

9715* The Stretching Frequency of the Azo-Group. R. J. W. Le Fèvre and R. L. Werner. *Australian Journal of Chemistry*, v. 10, Feb. 1957, p. 26-33.

Infra-red absorptions reported for 25 azoaryl derivatives indicate that the azo-stretching frequencies in azobenzenes lie between 1400 and 1450 cm^{-1}.

9716* The Cardiac Glycosides of *Gomphocarpus Fruticosus* R. BR. II. Gomphoside. T. R. Watson and S. E. Wright. *Australian Journal of Chemistry*, v. 10, Feb. 1957, p. 79-84.

Structure and characteristics.

9717 The Olefinic Bond in Gelsemine. Léo Marion and K. Sargeant. *Canadian Journal of Chemistry*, v. 35, Apr. 1957, p. 301-304.

The readily reducible double bond of gelsemine is present in a vinyl side chain and not in an exocyclic methylene group as previously assumed.

9718 Hydrogenolysis of Carbohydrates. II. Reduction of Methyl α-D-Glucopyranoside. E. von Rudloff, D. E. Stuetz, and H. F. Bauer. *Canadian Journal of Chemistry*, v. 35, Apr. 1957, p. 315-321.

Reaction produced a complex mixture of alcohols, the major components being 2-hydroxymethyl-4,5-dihydroxytetrahydropyran methanol, isomeric hexanediols, 1,2-propanediol, and ethanediol.

9719 Some Acenaphthene Compounds. E. H. Charlesworth, H. Campbell, J. J. Conn, C. T. Elston, and D. L. Stachiw. *Canadian Journal of Chemistry*, v. 35, Apr. 1957, p. 351-357.

A new geometric isomer of 1,2-dichloracenaphthene was isolated among the reaction products of acenaphthylene and HClO. Some new derivatives of acenaphthenone and acenaphthenol are reported.

9720 Enhancing Iodine. *Chemical and Engineering News*, v. 35, Apr. 15, 1957, p. 80.

Iodine sanitizing solutions were generally as effective in 10 sec. as in 1 min. when there were 10 p.p.m. iodine or more. Iodophors have several advantages over aqueous iodine solutions and are less toxic to people.

9721 Recent Advances in Isocyanate Chemistry. R. G. Arnold, J. A. Nelson, and J. J. Verbanc. *Chemical Reviews*, v. 57, Feb. 1957, p. 47-76.

Résumé extends a review published in 1948 to include the numerous contributions published since its preparation.

9722 Radical Substitution in Aromatic Nuclei. O. C. Dermer and M. T. Edmison. *Chemical Reviews*, v. 57, Feb. 1957, p. 77-122.

Aromatic nuclei are defined so as to include the unsaturated heterocyclic compounds of special ring stability. Substitution is defined as a one-step reaction in which a H atom on an aromatic nucleus (ArH), the substrate, becomes replaced by some atom or group other than another H or an Ar group derived directly from ArH.

9723 Homolytic Aromatic Arylation. D. R. Augood and Gareth H. Williams. *Chemical Reviews*, v. 57, Feb. 1957, p. 123-190.

Assembles recent relevant data associated with homolytic aromatic substitution reactions and assesses the progress that has been made towards understanding this and other types of aromatic substitution.

9724* (English.) **Synthetic Studies on the Benzofuran Derivatives. II. Reactions of Aromatic o-Hydroxyaldehyde Derivatives and Ethyl Bromomalonate.** Takashi Matsumoto and Kenji Fukui. *Chemical Society of Japan, Bulletin*, v. 30, Jan. 1957, p. 3-6.

9725 The Detection, by Means of Anthracene, of Free Radicals Formed in "Abnormal" Reactions of Grignard Reagents. R. O. C. Norman and William A. Waters. *Chemical Society, Journal*, Mar. 1957, p. 950-954.

9726 Tracer Studies in Ester Hydrolysis. IV. The Hydrolysis of Diphenylmethyl Formate and Acetate. C. A. Bunton, J. N. E. Day, R. H. Flowers, P. Sheel, and J. L. Wood. *Chemical Society, Journal*, Mar. 1957, p. 963-967.

9727 1:2-5:6-Di-*O-iso*propylidne-α - *D* - Glucofuranose 3-(Methyl Sulphate). A. B. Foster and E. B. Hancock. *Chemical Society, Journal*, Mar. 1957, p. 968-970.

Compound is obtained by oxidation of the corresponding methyl sulfite ester, and is converted into the 3-(sodium-sulfate) by NaI in acetone.

9728 Bromination of Triterpenoids of the Oleanane and Ursane Series. O. P. Arya and R. C. Cookson. *Chemical Society, Journal*, Mar. 1957, p. 972-978.

Esters of β-amyrin and of oleanolic acid are brominated first at $C_{(12)}$ and then at $C_{(16)}$, while 18 α-β-amyrin and α-amyrin are brominated at $C_{(12)}$ only.

9729 The Reaction of Anthracene With Benzyl Radicals. A. L. J. Beckwith and William A. Waters. *Chemical Society, Journal*, Mar. 1957, p. 1001-1008.

9730 Chalcones and Related Compounds. I. Preparation of Nitro-, Amino-, and Halogeno-chalcones. II. Addition of Thiols and Esters to the Chalcone System. III. Addition of Benzene Analogues to the Chalcone System. W. Davey and J. R. Gwilt. *Chemical Society, Journal*, Mar. 1957, p. 1008-1019.

9731 Alkyl Migration in Some Organophosphorus Amidates. J. I. G. Cadogan. *Chemical Society, Journal*, Mar. 1957, p. 1079-1082.

Decomposition of the alkyl esters of phosphoramidic and phosphonamidic acids gives tertiary amines. *P*-Alkyl-*NN'*-diphenylphosphonodiamidates, alone, are stable, but react vigorously with trialkyl phosphates to give high yields of dialkylanilines.

9732 The Organic Chemistry of Phosphorus. V. The Ester-Interchange Reaction Between Triphenyl Phosphite and Glycols. D. C. Ayres and H. N. Rydon. *Chemical Society, Journal*, Mar. 1957, p. 1109-1114.

9733 The Constitution of Aspidospermine. II. Ultraviolet Absorption of the *Bz*-Methoxy-Tetra- and -Hexa-Hydrocarbazoles. III. Reactivity at the Nitrogen Atoms, and Biogenetic Considerations. A. J. Everett, H. T. Openshaw, and G. F. Smith. *Chemical Society, Journal*, Mar. 1957, p. 1115-1123.

9734 Action of Acidic Reagents on Methyl 2-Arylvinylcarbamates. K. W. Gopinath, T. R. Govindachari, K. Nagarajan, and K. K. Purushothaman. *Chemical Society, Journal,* Mar. 1957, p. 1144-1148.

N-2-Arylvinylcarbamates with activating substituents in the ring are converted into 2-arylnaphthalenes by acidic reagents. With $POCl_3$, methyl styrylcarbamate yields predominantly 3:5-diphenylpyridine.

9735 Some Reactions of Cyclopropane and a Comparison With the Lower Olefins. III. The Friedel-Crafts Reaction. C. F. H. Tipper and D. A. Walker. *Chemical Society, Journal,* Mar. 1957, p. 1199-1206.

With *cyclo*propane the initial rate depended only on the catalyst concentration at "high" gas pressures and concentrations of aromatic compound, while at "low" concentrations the rate also varied with the pressure of gas and the nature and concentration of the aromatic compound.

9736 Mechanism of Substitution at a Saturated Carbon Atom. LIII. Conductances of Some Quaternary Ammonium Salts in Benzene, as a Preliminary to the Study of Unimolecular Nucleophilic Substitution in That Solvent. E. D. Hughes, C. K. Ingold, S. Patai, and Y. Pocker. **LIV. Kinetics of Chlorine Exchange Between Triphenylmethyl Chloride and Tetra-*n*-Butylammonium Chloride in Benzene.** E. D. Hughes, C. K. Ingold, S. F. Mok, S. Patai, and Y. Pocker. **LV. Kinetics of the Reaction of Triphenylmethyl Chloride With Tetra-*n*-Butylammonium Azide in Benzene.** E. D. Hughes, C. K. Ingold, S. Patai, and Y. Pocker. **LVI. Kinetics of the Reaction of Triphenylmethyl Chloride With Methyl Alcohol in Benzene.** E. D. Hughes, C. K. Ingold, S. F. Mok, and Y. Pocker. **LVII. Kinetics of the Reaction of Triphenylmethyl Chloride With Benzyl Alcohol in Benzene.** E. D. Hughes, C. K. Ingold, S. Patai, and Y. Pocker. **LVIII. Mechanism of S_N1 Substitutions in a Solvent of Low Solvating Power. A Comparative Discussion.** E. D. Hughes, C. K. Ingold, S. F. Mok, S. Patai, and Y. Pocker. **LIX. Kinetics and Mechanism of the Reaction of Methyl Bromide With Pyridine in Benzene.** Y. Pocker. *Chemical Society, Journal,* Mar. 1957, p. 1206-1283.

9737 The Relative Stabilising Influences of Substituents on Free Alkyl Radicals. II. The Addition of Aliphatic Aldehydes to $\beta\beta$-Di-Methylacrylic Acid and Its Derivatives. R. L. Huang. *Chemical Society, Journal,* Mar. 1957, p. 1342-1348.

9738 Cyclitols. V. Paper Ionophoresis, Complex Formation With Borate, and the Rate of Periodic Acid Oxidations. S. J. Angyal and D. J. McHugh. *Chemical Society, Journal,* Mar. 1957, p. 1423-1431.

The ionophoretic mobilities of some 29 cyclitols and related compounds were determined in $Na_2B_4O_7$ solutions. The initial rate of the reaction between cyclitols and periodic acid is found to vary considerably with configuration.

9739* (Russian.) Synthesis of Trialkylbutadienylsilanes. **Sintez trialkilbutadienilsilanov.** S. I. Sadykhzade and I. V. Avgushevich. *Doklady Akademii Nauk SSSR,* v. 112, Feb. 1, 1957, p. 662-665.

The attempt to synthesize 2-trialkylsilylbutadiene by using chloroprene in N atmosphere over Si-Cu alloy at 420 to 450 C did not succeed because of cyclodimerization of the chloroprene before it could react.

9740* (Russian.) Alkylation of Benzene by Ethylene in the Presence of a Series of Phosphoric Acids Containing Fluorine and Boron Fluoride. **Alkilirovanie benzola etilenom v prisutstvii riada fosfornykh kislot, soderzhashchikh ftor i ftoristyi bor.** A. V. Topchiev and V. N. Andronov. *Doklady Akademii Nauk SSSR,* v. 112, Feb. 1, 1957, p. 666-668.

Study of benzene alkylation by ethylene in the presence of molecular compounds of phosphoric, monophosphoric, and diphosphoric acids saturated with boron fluoride. The experiments show that the highest yields and shortest time were obtained when monophosphoric acid was used.

9741* (Russian.) Addition of Trialkylphosphites to α,β-Unsaturated Aldehydes. **Prisoedinenie trialkilfosfitov k α,β-nepredel'nym al'degidam.** G. Kamai and V. A. Kukhtin. *Doklady Akademii Nauk SSSR,* v. 112, Feb. 11, 1957, p. 868-871.

9742* (Russian.) Alkylation of Benzene by Propylene in the Presence of Phosphoric Acids Containing Fluorine and Boron Trifluoride. **Alkilirovanie benzola propilerom v prisutstvii riada fosfornykh kislot, soderzhashchikh ftor i ftoristyi bor.** A. V. Topchiev and V. N. Andronov. *Doklady Akademii Nauk SSSR,* v. 112, Feb. 11, 1957, p. 876-879.

9743 Reaction of Hydrocarbons With *Tert*-Butoxy Radicals. J. H. T. Brook. *Faraday Society, Transactions,* v. 53, Mar. 1957, p. 327-332.

9744 The Reactivity of Hydroxyl Radicals in Aqueous Solution. I. Reactions With Hydrogen and Carbon Monoxide. F. S. Dainton and T. J. Hardwick. *Faraday Society, Transactions,* v. 53, Mar. 1957, p. 333-343.

9745 Experimental Studies of Solution Processes. I. Evidence of the Dimerization of Nitromethane in Carbon Tetrachloride and in Cyclohexane. P. A. D. de Maine, M. M. de Maine, and A. G. Goble. *Faraday Society, Transactions,* v. 53, Apr. 1957, p. 427-432.

9746* (German.) The Influence of Condensed Phosphates on Active Oxygen in Washing Agents and Washing Liquors. **Der Einfluss der kondensierten Phosphate auf den Aktivsauerstoff in Waschmitteln und Waschflotten.** K. Lindner. *Fette, Seifen, Anstrichmittel,* v. 59, Jan. 1957, p. 8-16.

9747* (German.) The Structure of Wax-Solvent Systems. **Zur Struktur von Wachs-Lösungsmittel-Systemen. I.** W. Presting, K. Steinbach, and H. Beeckmann. *Fette, Seifen, Anstrichmittel,* v. 59, Jan. 1957, p. 17-27.

From the determination of wax solubilities it is concluded that there is a possibility of rating soft and hard waxes by measurement of the "cold benzine-solubility" for which an apparatus is developed and recommended for purpose of conventional testing.

9748* (German.) The Synthesis of Phospholipids. **Die Synthese von Phospholipiden.** T. Malkin. *Fette, Seifen, Anstrichmittel,* v. 59, Feb. 1957, p. 77-80.

Structural details. New methods for synthesis of kephalin, phosphatidyl-serin, and acetalphospholipids.

9749* (German.) Investigation of Iodine-Starch Reaction. **Untersuchung der Jod-Reaktion von Stärke.** J. Holló and J. Szejtli. *Fette, Seifen, Anstrichmittel,* v. 59, Feb. 1957, p. 94-98.

The reaction between I and the amylose of starch was studied by means of amperometric titration followed by titration of the free I with thiosulfate.

9750 (German.) Phenylbutazone Derivatives. **Über Derivate des Phenylbutazons. III.** Structure of the γ-Keto-Phenylbutazone Reducero. **Die Struktur der Reduktionsprodukte des γ-Keto-phenylbutazons.** E. Girod, R. Delley, and F. Häfliger. *Helvetica Chimica Acta,* v. 40, no. 2, 1957, p. 408-428.

The pK values (in methylcellosolve), the ultra-violet and infrared spectra of a number of pyrazolidine-3,5-dione derivatives and some related compounds were measured. Data are used to prove the structure of γ-hydroxy-phenylbutazone [1,2-diphenyl-4-(γ-hydroxy-n-butyl)-pyrazolidine-3,5-dione] (II).

9751* Oxidations With Silver Iodide Dibenzoate. II. Preparation of *s*-Azo Compounds From Some Aromatic Primary Amines. P. S. Raman. *Indian Academy of Sciences, Proceedings,* v. 45, sec. A, Feb. 1957, p. 65-68.

Reaction probably proceeds through a free radical mechanism in which the highly reactive R-NH radical plays a part.

9752* Studies on the Fundamental Reactions of the Fischer-Tropsch Synthesis From Reaction Balances. E. Weingaertner, P. K. Deshpande, and M. Ramacharyulu. *Indian Institute of Science, Journal,* v. 39, sec. A, Jan. 1957, p. 56-75.

9753* (Russian.) Regularities in Chlorination of Silicoorganic Compounds. **O nekotorykh zakonomernostiakh khlorirovaniia kremneorganicheskikh soedinenii.** V. F. Mironov and V. A. Ponomarenko. *Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk,* no. 2, Feb. 1957, p. 199-206.

From many examples, a general method of photochemical chlorination of alkyl silane and disilane chlorides was evolved, resulting in a high yield of monochlorinated products. The chlorinator is a simple apparatus where the monochloride formed is continuously separated from the zone of reaction and

no longer has contact with chlorine. Advantages of this method over chlorination by SO_2Cl_2 include high yield and purity of the product.

9754 The Physical and Chemical Properties of the Alkyl Hydrazines. R. C. Harshman. *Jet Propulsion*, v. 27, Apr. 1957, p. 398-400.

9755 Use of Hydrazine as a Reducing Agent for Unsaturated Compounds. III. Hydrogenation of Linoleic Acid. IV. The Hydrogenation of Elaeostearic Acid From Tung (China Wood) Oil. F. Aylward and C. V. Narayana Rao. *Journal of Applied Chemistry*, v. 7, Mar. 1957, p. 134-144.

9756 Hindered Diphenoquinones: Diradicals of Oxygen. Jean Bourdon and Melvin Calvin. *Journal of Organic Chemistry*, v. 22, Feb. 1957, p. 101-116.

The 2,2'-dimethyl-5,5'-di-*t*-butyldiphenoquinone was prepared and shown to be in equilibrium with a small amount of diradical. This compound slowly polymerizes.

9757 Reversible Oxidation of Phthalocyanines. C. J. Pedersen. *Journal of Organic Chemistry*, v. 22, Feb. 1957, p. 127-132.

Phthalocyanines can be reversibly oxidized in non-aqueous media to substances soluble in organic solvents and from which the phthalocyanines can be regenerated by reduction. Properties of the oxidation products suggest that they are formed by the addition of a molecule of the oxidant to the phthalocyanine molecule but modified by solvolysis in the case of reactive solvents.

9758 Halogen Reactivities. VIII. 2-Halofurans. Donald G. Manly and E. D. Amstutz. *Journal of Organic Chemistry*, v. 22, Feb. 1957, p. 133-134.

The kinetics of nucleophilic displacement with piperidine of 2-halofurans, 5-methyl-2-iodofuran, and 5-chloro-2-furoyl-piperidide were investigated.

9759 Substituted Biphenyls by Action of Benzoyl Chloride on Some β-Aroylpropionic Acids. Andrew S. Kende and Edwin F. Ullman. *Journal of Organic Chemistry*, v. 22, Feb. 1957, p. 140-143.

The reaction of three β-aroylpropionic acids with benzoyl chloride is shown to give substituted phthalides in the biphenyl series.

9760 Triethyltin Haloacetates, Halopropionates, and Propenoates. Herbert H. Anderson. *Journal of Organic Chemistry*, v. 22, Feb. 1957, p. 147-148.

Preparation and properties of 14 compounds.

9761 Preparation and Oxidation of 1,2-Diamino-1,2-Dimethylguanidine. William R. McBride, William G. Finnegan, and Ronald A. Henry. *Journal of Organic Chemistry*, v. 22, Feb. 1957, p. 152-157.

9762 Syntheses and Ultraviolet Spectra of 1-(5- and 8-Methyl-1-Naphthyl)-1-Cyclopentenes and 1-Cyclohexenes. L. H. Klemm, J. W. Sprague, and E. Y. K. Mak. *Journal of Organic Chemistry*, v. 22, Feb. 1957, p. 161-166.

9763 A Series of ω-Trimethylammoniumalkylphosphonic Acids and Their Diethyl Ester Iodides. Terrell C. Myers and Abbas O. Jibril. *Journal of Organic Chemistry*, v. 22, Feb. 1957, p. 180-182.

These compounds are analogs of naturally occurring choline esters and trimethylammoniumalkylcarboxylic acids. As such they may serve as alternate substrates or as inhibitors involving the natural metabolites.

9764 New Fluorine-Containing Aromatics as Potential Carcinostats. Ng. Ph. Buu-Hoi, N. D. Xuong, and R. Rips. *Journal of Organic Chemistry*, v. 22, Feb. 1957, p. 193-197.

A large number of fluorine-containing aromatic acids, nitriles, and ketones were synthesized from various fluoro aromatics for biological testing as potential carcinostatic agents.

9765 Formazyl Complexes of the Quinoline Series. Muvaffak Seyhan and W. Conard Fernelius. *Journal of Organic Chemistry*, v. 22, Feb. 1957, p. 217-219.

Three compounds of the general formula $C_6H_5NH{-}N{=}CR{-}N{=}NC_6H_4COOH$ and three of the type $C_6H_5NH{-}N{=}CR{-}N{=}NC_6H_5$ are described.

9766* (Russian.) Hydrogenation of Aldehydes Obtained by Carbonization of Diesel Fractions of Shale Tars. **Gidrirovanie aldegidov, poluchennykh karbonilirovaniem dizel'noi fraktsii slantsevoi smoly.** M. M. Ketslakh and D. M. Rudkovskii. *Khimiia i Tekhnologiia Topliva*, no. 3, Mar. 1957, p. 1-7.

A Cu-Cr-Ba catalyst is the most effective means for the hydrogenation of shale aldehydes in alcohols.

9767* (Russian.) The Reaction of Ammonia and Amines With α-Oxides and Hydroxyoxides of Acetylenic and Vinylacetylenic Series. Synthesis of Acyl-Vinyl- and Phenyl-Pyrroles. **Vzaimodeistvie ammiaka i aminov s α-okisiami i spirtookisiami atsetilenovogo i vinilatsetilenovogo riada. Sintez alkil-vinil,-fenipirrolov i pirril-karbinolov.** F. Ia. Perveev, E. M. Vekshina, and L. N. Surenkova. *Leningradskogo Universiteta, Vestnik Seriia Fiziki i Khimii*, v. 12, no. 4, 1957, p. 134-144.

9768* Fatty Acyl Alkylolamides. II. Applications. K. R. Dutton and W. B. Reinisch. *Manufacturing Chemist*, v. 28, Apr. 1957, p. 176-180.

Principle applications include washing compositions, soap, emulsifiers, and lipsticks.

9769 Polyphenyls Literature Search. Edward H. Smith. *Glenn L. Martin Company (U. S. Atomic Energy Commission)*, ER-8098, Mar. 1956, 56 p. (UF767 Un3.1e Contin.)

Data obtained from a brief search of recent literature relating to the organic, physical, and analytical chemistry of the polyphenyls.

9770* (German.) Urea - Formaldehyde Condensation. **Zur Kenntnis der Harnstoff-Formaldehyd-Kondensation. XVI.** Reaction Between Urethan and Formaldehyde. **Über die Reaktion von Urethan mit Formaldehyd.** G. Zigeuner and W. Hoselmann. *Monatshefte für Chemie*, v. 88, Feb. 1957, p. 5-10.

Formation of dimethylene ether from urethan and formaldehyde in alkali solution. Mixed acetates are produced when an excess of formaldehyde is used.

9771 Organic Synthesis. v. I. Open-Chain Saturated Compounds. v. II. Open-Chain Unsaturated Compounds. Alicyclic Compounds. Aromatic Compounds. Vartkes Migrdichian. 1822 p. 1957. Reinhold Publishing Corp., New York. (QD262 M58o)

A comprehensive and concise presentation of all synthesis reactions excepting the majority of those leading to the formation of heterocyclic bodies.

9772* (English.) **Investigations on Pyrazine Derivatives.** H. I. X. Mager and W. Berends. *Recueil des Travaux Chimiques des Pays-Bas*, v. 76, Jan. 1957, p. 28-34.

Preparation of pyrazine tetracarboxylic acid from o-diaminobenzene. A very high stability is indicated by the fact that a dihydro-compound only is produced on hydrogenating the tetraethyl ester at high pressures and temperatures.

9773* (English.) **The Methylation of 3-Hydroxypyridine.** D. A. Prins. *Recueil des Travaux Chimiques des Pays-Bas*, v. 76, Jan. 1957, p. 58-64.

Preparation of 3-methoxypyridine and its N-oxide from 3-hydroxypyridine.

9774* The Present and Future Scope of Peptide Synthesis. G. W. Kenner. *Society of Leather Trades' Chemists, Journal*, v. 41, Mar. 1957, p. 75-86.

9775* (English.) **Constituents of Tall Oil. II. The Nature of a Solid Hydrocarbon Fraction of the So-Called B-Oil.** Hilding Bergström, Ragnar Ryhage, and Einar Stenhagen. *Svensk Papperstidning*, v. 60, Feb. 15, 1957, p. 96 + 3 pages.

Mass spectrometry found the derivative to consist of a mixture of the normal-chain saturated C_{20}, C_{22}, C_{24}, C_{26}, and C_{32} hydrocarbons together with an ethylenic C_{26} hydrocarbon.

9776* (Russian.) Tautomerism of Some Derivative Heterocyclic Compounds. **O tautometrii nekotorykh proizvodnykh geterotsiklicheskikh soedinenii. II.** The Infra-Red and Ultra-Violet Spectra and Structure of the 2-Amino Derivatives of Thiazole. **Infrakrasnye i ul'trafioletovye spektry i stroeni 2-aminoproizvodnykh tiazola.** Iu. N. Sheinker, V. V. Kushkin, and I. Ia. Postovskii. *Zhurnal Fizicheskoi Khimii*, v. 31, Jan. 1957, p. 214-226.

9777 (Russian.) Viscosity of Binary Systems With Chloral. **Viazkost' binarnykh sistem s khloralem. IV.** V. V. Udovenko and R. I. Khomenko. *Zhurnal Obshchei Khimii*, v. 27, Jan. 1957, p. 37-40.

A study of viscosity and thickness of the following systems: chloral-acetophenone, chloral-benzophenone, chloral-benzaldehyde, and chloral-salicylic aldehyde at 25, 50, and 75 C.

9778 (Russian.) A Study of Myrcene Dioxide. **K issledovaniiu diokisi mirtsena.** G. V. Pilulevskii and N. A. Adrova. *Zhurnal Obshchei Khimii*, v. 27, Jan. 1957, p. 136-137.

The structure 2, 3, 6, 6'-dioxide-2-methyl-6-methylene-octene 7 (III) was due to myrcene dioxide forming during the oxidation of myrcene by hydrogen peroxide. During the hydration of myrcene dioxide a dihydromyrcene dioxide was formed.

9779 (Russian.) Chemistry of Selenophene. **Khimiia selenofena. V.** Selenophene - 2 - Aldehyde. Selenophene-2-Carbinol and Selenophene-2-Acrylic Acid. **Selenofen-2-al'degid. Selenofen-2-karbinol i selenofen-2-akrilovaia kislota.** Iu. K. Iur'ev and N. N. Mezentsova. *Zhurnal Obshchei Khimii*, v. 27, Jan. 1957, p. 179-182.

By formulation of selenophene by dimethylformamide in the presence of phosphorus oxychloride, a new selenophene-2-aldehyde was produced, which has the typical properties of an aromatic aldehyde.

9780* (Russian.) Investigations in the Field of Alkoxy-Silanes. **Issledovaniia v oblasti alkoksisilanov.** M. G. Voronkov and G. B. Karpenko. *Zhurnal Obshchei Khimii*, v. 27, Feb. 1957, p. 325-327.

It is shown that the reesterification reaction of silicon-ethylal ether by phenols in the presence of the respective sodium phenolate results in the formation of tetraaroxysilane with a yield of 70 to 85%. Eleven tetraaroxysilanes were synthesized this way, as well as cyclohexanol, orthosilicic esters, cyclopentanol, and benzyl alcohol.

9781* (Russian.) Ketovinylation of Thiophenol. **Ketovinilirovanie tiofenolov.** N. K. Kochetkov and V. N. Vinogradova. *Zhurnal Obshchei Khimii*, v. 27, Feb. 1957, p. 460-464.

A synthesis of until-now-unknown aryl-β-acylvinylsulfides was accomplished with high yields from the reaction of β-chlorovinylketones with thiophenols in an alkali medium. Some of the reactions of these compounds were studied. A close similarity with other β-replaced vinylketones was established.

9782* (Russian.) Synthesis of Arylthioureas and the Respective Mustard Oils. **Metod sinteza ariltiomochevin i sootvetstvuiushchikh gorchichnykh masel.** N. I. Volynkin. *Zhurnal Obshchei Khimii*, v. 27, Feb. 1957, p. 483-485.

Optimum conditions for condensation of urea with amines, such as phenetidine, with the purpose of obtaining phenetolecarbamide, were established. It was found that the condensation of the thiourea and amine does not take place under conditions favorable for urea.

9783* (Russian.) Reaction of Chloroform, Bromoform, and Silico-Chloroform With Sodium Triphenyl-Silanolate. **Vzaimodeistvie chloroforma, bromoforma, silikokhloroforma s trifenilsilanoliatom natriia.** V. S. Chugunov. *Zhurnal Obshchei Khimii*, v. 27, Feb. 1957, p. 494-496.

Starting with chloroform or bromoform, and sodium triphenyl-silanolate, the tris-(triphenylsiloxy) methane was obtained with high yields (60 to 70%). Shows that silico-chloroform, just like the silicon chloride reacts with Na-triphenyl-silanolate developing triphenyl-dichlordisiloxane, bis-(triphenylsiloxy) chlorsilane, and tris-(triphenylsiloxy)-silane.

See also: **9594** (analysis of essential oils); **10023** (oxidation and reduction by electrochemical methods); **10587** (polyphenyl flammability); **10870** (development of fast dyes).

CHEMISTRY—PHYSICAL

9784* The Acid - Catalysed Solvolysis of Alkoxymethyl Esters. I. The Relation Between the Rate of Hydrolysis and the Acidity Function. II. Reaction Rates and Products in the Solvolysis of Methoxymethyl Esters in Methanol-Water Mixtures. Pentti Salomaa. *Acta Chemica Scandinavica*, v. 11, no. 1, 1957, p. 132-150.

9785* (English.) **Complexes of the 4d- and 5d-Groups. III. Absorption Spectra of Marcel Delépine's Rhodium(III) and Iridium(III) Complexes. IV. Electron Transfer Bands With Special Application to M. Delépine's Complexes and a Transition From Iridium(III) to Pyridine, With Some Remarks About Intermediate Coupling in Halide Complexes and the Uranyl Ion.** Chr. Klixbüll Jørgensen. *Acta Chemica Scandinavica*, v. 11, no. 1, 1957, p. 151-178.

9786* (English.) **The Use of Perturbation Methods for Quantum-Chemical Investigations of Systems Built Up From Identical Units.** R. Pauncz. *Acta Physica Academiae Scientiarum Hungaricae*, v. 6, nos. 3-4, 1957, p. 399-421.

9787* (German.) Electron Emission of Catalysts. **Zur Frage der Elektronenemission von Katalysatoren.** H. Nassenstein and R. Menold. *Acta Physica Austriaca*, v. 10, no. 4, 1957, p. 453-459.

Electron emission was studied in catalysts of similar chemical composition but of different activity. The meaning of this investigation in relation to heterogeneous catalysis is discussed.

9788 Bolaform Electrolytes. VI. Conductance of Bis-(Trimethylammonium)-Polymethylene Iodides and Related Compounds in Methanol and in Ethanol. Ormond V. Brody and Raymond M. Fuoss. *American Chemical Society, Journal*, v. 79, Apr. 5, 1957, p. 1530-1533.

Presents conductance data for bis-(trimethylammonium)-trimethylene diiodide, bis-(trimethylammonium)-tetramethylene diiodide, bis - (trimethylammonium) - pentamethylene diiodide, tetramethylammonium iodide, methylpyridinium iodide, and dimethylpiperidinium iodide in ethanol at 25 C; tetramethylammonium iodide and bromide, methylpyridinium iodide, dimethylpiperidinium iodide, and 1,1-methane-N,N'-bispyridinium diiodide in methanol at 25 C.

9789 The Photoöxidation of Diethyl Ketone. J. Eric Jolley. *American Chemical Society, Journal*, v. 79, Apr. 5, 1957, p. 1537-1542.

At temperatures from 35 to 150 C the CO yield becomes small at high O pressures, thus indicating that the propionyl radical reacts with O without producing CO.

9790 The Thermal Decomposition of Ethylcyclobutane. Russel E. Wellman and W. D. Walters. *American Chemical Society, Journal*, v. 79, Apr. 5, 1957, p. 1542-1546.

At 420 to 460 C the products were found to be almost exclusively ethylene and 1-butene.

9791 Thermodynamic Properties of Technetium and Rhenium Compounds. VI. The Potential of the ReO_2/ReO_4^- Electrode and the Thermodynamics of Rhenium Trioxide. J. P. King and J. W. Cobble. *American Chemical Society, Journal*, v. 79, Apr. 5, 1957, p. 1559-1563.

9792 Radiation Chemistry Studies With Cyclotron Beams of Variable Energy: Yields in Aerated Ferrous Sulfate Solution. Robert H. Schuler and Augustine O. Allen. *American Chemical Society, Journal*, v. 79, Apr. 5, 1957, p. 1565-1572.

Yields in 0.8 *N* sulfuric acid were determined for beams of He ions and deuterons of various energies.

9793 Infrared Absorption Spectra of Inorganic Coördination Complexes. X. Studies of Some Metal-Urea Complexes. R. B. Penland, S. Mizushima, Columba Curran, and J. V. Quagliano. *American Chemical Society, Journal*, v. 79, Apr. 5, 1957, p. 1575-1578.

The spectra reveal that urea forms nitrogen-to-metal bonds with Pt(II) and Pd(II), and oxygen-to-metal bonds with Cr(III), Fe(III), Zn(II), and Cu(II).

9794 Picrotoxin. III. α-Picrotoxininic and Bromopicrotoxininic Acids; Apopicrotoxininic Dilactone. Harold Conroy. *American Chemical Society, Journal*, v. 79, Apr. 5, 1957, p. 1726-1733.

Potassium metaperiodate uptake by the following compounds and their hydrolytic homologs are: β-bromopicrotoxininic acid (0) alk. (2.98 equiv.), dihydro-β-bromopicrotoxininic acid (0) alk. (−), apopicrotoxininic dilactone, acid (0) alk. (3.70 equiv.).

9795 Spectrophotometric Relationships Between Furoxanes and Nitroso Compounds. J. H. Boyer, U. Toggweiler, and G. A. Stoner. *American Chemical Society, Journal,* v. 79, Apr. 5, 1957, p. 1748-1751.

9796 Classical Partition Functions for Transition State Theory. Chlorine Atom Reactions. Kenneth S. Pitzer. *American Chemical Society, Journal,* v. 79, Apr. 20, 1957, p. 1804-1807.

The classical formulation of the partition function is a valid and useful approximation in calculations for activated complexes in most cases.

9797 Reduction of Chromium(VI) Compounds by Liquid Ammonia and by Liquid Ammonia Solutions of Potassium Amide. Stanley I. Tannenbaum, Russell S. Drago, and Harry H. Sisler. *American Chemical Society, Journal,* v. 79, Apr. 20, 1957, p. 1815-1819.

9798 X-Ray and Infrared Studies of the Addition Compounds of Titanium Tetrabromide With 1,4-Dioxane, Tetrahydrofuran and Tetrahydropyran. Robert F. Rolsten and Harry H. Sisler. *American Chemical Society, Journal,* v. 79, Apr. 20, 1957, p. 1819-1821.

Deals with the results of infra-red, X-ray, and cryoscopic studies of $TiBr_4 \cdot$ 1,4-dioxane, $TiBr_4 \cdot 2C_4H_8O$, and $TiBr_4 \cdot 2C_5H_{10}O$.

9799 Spectra of the Peroxy Complexes of Niobium in Sulfuric Acid. N. Adler and C. F. Hiskey. *American Chemical Society, Journal,* v. 79, Apr. 20, 1957, p. 1827-1830.

Reveals the existence of three peroxy-niobium complexes.

9800 Composition of the Peroxy Complexes of Niobium (V) in Sulfuric Acid. N. Adler and C. F. Hiskey. *American Chemical Society, Journal,* v. 79, Apr. 20, 1957, p. 1831-1834.

9801 Polarography in Acetonitrile. II. Metal Ions Which Have Significantly Different Polarographic Properties in Acetonitrile and in Water. Anodic Waves. Voltammetry at Rotated Platinum Electrode. I. M. Kolthoff and J. F. Coetzee. *American Chemical Society, Journal,* v. 79, Apr. 20, 1957, p. 1852-1858.

9802 The Stereochemistry of the Ivanov and Reformatsky Reactions. I. Howard E. Zimmerman and Marjorie D. Traxler. *American Chemical Society, Journal,* v. 79, Apr. 20, 1957, p. 1920-1923.

The diastereomer of 2,3 - diphenyl - 3 - hydroxypropionic acid, m.p. 144 C, was isolated as a minor product.

9803 Mercaptan Catalysis in Thermoneutral Free Radical Exchange. Chi-Hua Wang and Saul G. Cohen. *American Chemical Society, Journal,* v. 79, Apr. 20, 1957, p. 1924-1929.

The exchange of $(C_6H_5)_2CH\cdot$ with $(C_6H_5)_2CH_2$ was studied.

9804 Vapor-Liquid Equilibria for Hydrogen-Light-Hydrocarbon Systems at Low Temperatures. Alvin L. Benham and Donald L. Katz. *A.I.Ch.E., Journal,* v. 3, Mar. 1957, p. 33-36.

9805 Mass Transfer at Low Pressures. Thomas K. Sherwood and Norman E. Cooke. *A.I.Ch.E., Journal,* v. 3, Mar. 1957, p. 37-42.

Data for the evaporation of spheres of naphthalene into air, He, Co_2, and Freon-12, and of liquid diethyl adipate into air at pressures from 0.1 to 3,000μ Hg and at Reynolds numbers from 0 to 1.37.

9806 Studies of Thermal Conductivity of Liquids. III. Byron C. Sakiadis and Jesse Coates. *A.I.Ch.E., Journal,* v. 3, Mar. 1957, p. 121-126.

Values of thermal conductivity and temperature coefficients for 35 pure organic liquids.

9807* (English.) **The Thermodynamics of Ion Exchange Equilibria. II. Relative Magnitude of Formal Osmotic Free Energy and Formal Ionic Interaction Free Energy. III. On the Prediction of Ion Exchange Equilibria.** Lennart W. Holm. *Arkiv för Kemi,* v. 10, no. 5, 1957, p. 445 + 19 pages.

9808* The Mechanism of the Pinacol-Pinacone Rearrangement. IV. Exchange and Rearrangement With Hydrogen Isotopes. V. Carbon Isotope Effects. J. F. Duncan and K. R. Lynn. *Australian Journal of Chemistry,* v. 10, Feb. 1957, p. 1-25.

9809* The Permanganate-Coloured "Dimer" of Diphenylketen. R. S. Armstrong and R. J. W. Le Fèvre. *Australian Journal of Chemistry,* v. 10, Feb. 1957, p. 34-39.

The substance $C_{28}H_{20}O_2$ formed by the pyrolysis of benzilic acid, has a dipole moment of c.6 D and shows ketonic absorptions in the infra-red spectral region.

9810 Kinetics of the Thermal Decomposition of Hydrogen Peroxide Vapor. Paul A. Giguère and I. D. Liu. *Canadian Journal of Chemistry,* v. 35, Apr. 1957, p. 283-293.

Rates were measured by the static method at low pressures (0.2 to 20 mm. Hg), over the temperature range 300 to 600 C. The reaction was of the first order with respect to time and the final products were only water and oxygen. Reaction rates increased regularly with pressure.

9811* Chemical & Engineering Data Series. Pt. I. Phase Equilibria, Molecular Transport and Thermodynamics. Pt. II. Physical Properties and Evaluation of Compounds and Materials. v. I. 130 p. 1956. American Chemical Society, Washington, D. C. (QD501 In3c Ref.)

Includes articles consisting essentially of data obtained through known concepts, or by known methods, or extensions of such data and articles which list physical properties as an end in themselves, or as aids to other studies and calculations. Planned as a semi-annual publication.

9812 H_0 and Related Indicator Acidity Functions. M. A. Paul and F. A. Long. *Chemical Reviews,* v. 57, Feb. 1957, p. 1-45.

Values of the H_0 function are tabulated for aqueous solutions of the mineral acids up to 10 *M* concentration. Data are available for solutions of acids in such solvents as formic acid, acetic acid, ethanol, dioxane, acetone, and mixtures with water.

9813* (English.) **Studies on Organic Phosphorescence. II. A Revision of Lewis' Mechanism for Phosphorescence.** Shunji Kato and Masao Koizumi. **III. Quenching by Some Gases and Vapors.** Shunji Kato. **IV. Quenching by Inorganic Salts.** Shunji Kato, Ko Kimura, and Masao Koizumi. *Chemical Society of Japan, Bulletin,* v. 30, Jan. 1957, p. 27-43.

Data on trypaflavine-silica gel phosphor.

9814* (English.) **Studies on Azeotropic Mixtures. II. Constancy of Molecular Interchange Energies in Homologous Azeotropic Series and Calculation of Azeotrope-Forming Range.** Toshio Yoshimoto and Yo-ichiro Mashiko. *Chemical Society of Japan, Bulletin,* v. 30, Jan. 1957, p. 56-61.

9815* (English.) **Electron Diffraction Investigation on the Molecular Structures of Some Organosilicon Compounds. I-II.** Masatoki Yokoi. *Chemical Society of Japan, Bulletin,* v. 30, Jan. 1957, p. 100-109.

Bond lengths were determined.

9816 Spectrophotometric Determination of the Dissociation Constant of Hydrogen Peroxide. S. S. Muhammad and T. Navaneeth Rao. *Chemical Society, Journal,* Mar. 1957, p. 1077-1078.

A value of $(2.63 \pm 0.12) \times 10^{-12}$ was derived at 30 C.

9817 Perturbation of Singlet-Triplet Transitions of Aromatic Molecules by Oxygen Under Pressure. D. F. Evans. *Chemical Society, Journal,* Mar. 1957, p. 1351-1357.

In most cases well-defined absorption bands were observed, which disappeared on removal of the oxygen. The longest-wavelength band almost exactly coincides with the shortest wavelengths phosphorescence band. Solvent shifts of singlet-triplet transitions are very small.

9818* (French.) A Qualititative Study of the Spectrum Produced by Thin Laminae of CuI at 77 K in Relation to Their Thickness. **Étude qualitative du spectre transmis par des lames minces de CuI à 77°K en fonction de leur épaisseur.** Serge Nikitine and René Reiss. *Comptes Rendus,* v. 244, Mar. 11, 1957, p. 1478-1481.

Thin laminae of CuI varying in thickness from a few microns to 0.05μ were studied at 77 K. In the case of the very thin laminae, the absorption spectrum was reduced to a few fine lines, whereas the continuous spectrum disappears.

9819* (French.) Ultra-Violet Absorption of Ethylene Nitriles. **Sur l'absorption ultraviolette des nitriles éthyléniques.** René Heilmann, Jane-Marie Bonnier, and M. Gabriel de Gaudemaris. *Comptes Rendus*, v. 244, Mar. 25, 1957, p. 1787-1789.

A study of absorption in the ultra-violet of a series of conjugated or non-conjugated and non-saturated nitriles. A rule similar to Woodwards rule used in the case of ethylene acetones was established.

9820* (French.) Effect of Argon Dissolved in Potassium Iodide Solutions Subjected to Ultrasonic Oxidation. **Influence de l'argon dissous dans les solutions d'iodure de potassium soumis à l'oxydation par les ultrasones.** Henri Guéguen. *Comptes Rendus*, v. 244, Apr. 1, 1957, p. 1926-1927.

The quantity of iodine emitted in the presence of A at 960 kc. does not vary as a function of the concentration of KI. There is a maximum release for a concentration of around 5%.

9821* (French.) Kinetics of Catalytic Chlorination of Acetic Anhydride. **La cinétique de la chloration catalytique de l'anhydride acétique.** Jean Lepage and Joseph-Charles Jungers. *Comptes Rendus*, v. 244, Apr. 8, 1957, p. 2056-2058.

The attack of molecular chlorine on acetic anhydride under the influence of I, $SnCl_4$, and $FeCl_3$ corresponds to definite and simple kinetics. In the three cases, the transformation is of the order of one in proportion to the catalyst and of zero in proportion to Cl.

9822* (French.) Polarography of Thiazole Derivatives. **Sur la polarographie des dérivés du thiazole.** Jean Tirouflet and Étienne Laviron. *Comptes Rendus*, v. 244, Apr. 8, 1957, p. 2063-2066.

9823* (Russian.) Recrystallization Diagram of Zirconium Iodide. **Diagramma rekristallizatsii iodidnogo tsirkoniia.** E. M. Savitskii and V. F. Terekhova. *Doklady Akademii Nauk SSSR*, v. 112, Jan. 11, 1957, p. 276-278 + 1 plate.

Presents recrystallization of ZrI_4 and changes of its hardness as a function of thermal treatment. Annealing samples was carried out at temperatures from 500 to 1200 C. Shows the microstructure of ZrI_4 and X-ray diffractograms of the same in various stages of annealing after cold rolling.

9824* (Russian.) Possibility of Separation of Boron Isotopes by Chemical Exchange. **O vozmozhnosti razdeleniia izotopov bora khimicheskim obmenom.** G. M. Panchenkov, V. D. Moiseev, and A. V. Makarov. *Doklady Akademii Nauk SSSR*, v. 112, Feb. 1, 1957, p. 659-661.

Describes a method of chemical separation of boron isotopes using a counter-flow system.

9825* (Russian.) Effect of γ-Radiation on Cetane Oxidation. **Deistvie γ-izlucheniia na reaktsiiu okisleniia tsetana.** M. A. Proskurnin, Iu. L. Khmel'nitskii, E. V. Barelko, A. T. Slepneva, and I. I. Melekhonova. *Doklady Akademii Nauk SSSR*, v. 112, Feb. 11, 1957, p. 886-889.

Co^{60} γ-ray radiation effect on cetane in the presence of molecular O.

9826 Density and Electrical Conductance in the System KCl-$ZnCl_2$. Frederick R. Duke and Richard A. Fleming. *Electrochemical Society, Journal*, v. 104, Apr. 1957, p. 251-254.

Phase diagram indicates the presence of the solid-state 2KCl-$ZnCl_2$. Density vs. composition isotherms in the range 475 to 650 C are approximately linear. Isotherms of equivalent conductivity deviate negatively from additivity when plotted against composition.

9827 Transport Numbers and Structures in Fused $AgNO_3$-$NaNO_3$ Mixtures. Frederick R. Duke, R. W. Laity, and Boone Owens. *Electrochemical Society, Journal*, v. 104, May 1957, p. 299-300.

9828 The Vibration-Rotation Infra-Red Spectrum of Silyl Iodide. R. N. Dixon and N. Sheppard. *Faraday Society, Transactions*, v. 53, Mar. 1957, p. 282-290.

A complete assignment of the fundamental vibration frequencies of SiH_3I is presented with the values of heat content, free energy, entropy, and heat capacity from 100 to 1000 K.

9829 The Photolysis of Hydrogen Peroxide at High Light Intensities. J. H. Baxendale and J. A. Wilson. *Faraday Society Transactions*, v. 53, Mar. 1957, p. 344-356.

The quantum yield for the photolysis of H_2O_2 by 2537 A light in 0·10 N perchloric acid is found to be 1·00 at 25 C and is independent of concentration and light intensity over the ranges studied.

9830 The Effect of Acrylamide on the X- and γ-Ray Yields of Hydrogen Peroxide From De-Aerated Water. E. Collinson, F. S. Dainton, and G. S. McNaughton. *Faraday Society, Transactions*, v. 53, Mar. 1957, p. 357-362.

The yields of H_2O_2 obtained by irradiating air-free aqueous solutions of acrylamide with 220 kvp or 50 kvp X-rays are dependent upon the initial concentration of acrylamide.

9831 Catalysis on Metals of Group 8. I. Reaction of Cyclopropane and of Propane With Deuterium Over a Palladium Catalyst. II. The Reaction of Deuterium With Propylene and With Propyl Chlorides Over a Palladium Catalyst. III. The Reaction of Cyclopropane and of Propane With Deuterium Over Rhodium and Iridium Catalysts. IV. The Reaction of Cyclopropane and of Propane With Deuterium Over a Platinum Catalyst. J. Addy and G. C. Bond. *Faraday Society, Transactions*, v. 53, Mar. 1957, p. 368-392.

9832 Phase Relationships in the Pyridine Series. VI. The Thermodynamic Properties of Mixtures of Pyridine, and of Three of Its Homologues, With Water. R. J. L. Andon, J. D. Cox, and E. F. G. Herington. *Faraday Society, Transactions*, v. 53, Apr. 1957, p. 410-426.

9833 Diamagnetism and Hydrogen Bond. K. Venkateswarlu and S. Sriraman. *Faraday Society, Transactions*, v. 53, Apr. 1957, p. 433-437.

The diamagnetic susceptibility of benzoic, cinnamic, and salicylic acids were determined in solution in a number of representative liquids at different concentrations.

9834 Spectrophotometric Studies of Electrolytic Dissociation. IV. Some Uranyl Salts in Water. E. W. Davies and C. B. Monk. **V. Dissociation Constants of 2:4-Dinitrophenol, Chloracetic Acid and Propionic Acid in 20% Aqueous Ethanol.** W. D. Bale and C. B. Monk. *Faraday Society, Transactions*, v. 53, Apr. 1957, p. 442-454.

9835 The Kinetics of the Gas-Phase Photochlorination of Trichloroethylene. F. S. Dainton, D. A. Lomax, and M. Weston. *Faraday Society, Transactions*, v. 53, Apr. 1957, p. 460-467.

9836 Freezing Points of Liquids Adsorbed on Porous Solids. Balwant Rai Puri, D. D. Singh, and Y. P. Myer. *Faraday Society, Transactions*, v. 53, Apr. 1957, p. 530-534.

Freezing-point depressions of benzene, dioxane, *p*-xylene, and ethylene diamine adsorbed on four different porous bodies at different relative vapor pressures corresponding to condensation in capillary pores of different radii were determined by measuring the equilibrium pressures of the system at different temperatures.

9837 (French.) Determining Diffusion Coefficients of Silver and Iodine in the Three Silver Iodide Modifications by Using the Method of Heterogeneous Isotopic Exchange. **Détermination des coefficients de diffusion de l'argent et de l'iode dans les trois modifications de l'iodure d'argent par la méthode des échanges isotopiques hétérogènes.** P. Jordan and M. Pochon. *Helvetica Physica Acta*, v. 30, Mar. 1957, p. 33-48.

The kinetics of heterogeneous isotopic exchange between the three allotropic modifications of silver iodide and its ions in aqueous solution was studied between 20 and 200 C. The exchange of the Ag^+ and I^- ions was determined.

9838 Comparison of Catalysts in Cracking Pure Methylcyclohexane and *n*-Decane. C. J. Plank, D. J. Sibbett, and R. B. Smith. *Industrial and Engineering Chemistry*, v. 49, Apr. 1957, p. 742-749.

Analysis of liquid and gaseous products of cracking at 495 C over typical silica-alumina, silica-magnesia, and fluoride-treated silica-alumina catalysts. The latter was most active and silica-magnesia least active for all important reactions.

9839 Crystal Habit of Paraffin Wax. R. T. Edwards. *Industrial and Engineering Chemistry*, v. 49, Apr. 1957, p. 750-757.

It is proposed that two basic types of wax crystals, best described as plates, form one above and the other below the

transition point. The high temperature plate curls to form needle crystals frequently considered characteristic of paraffin wax. Malcrystalline forms are either transition types or thin; imperfect examples of the basic plate forms.

9840 Diffusion in Gases at Elevated Pressures. Carbon-14-Labeled CO_2 in CO_2-H_2 and CO_2-Propane. Chan-Hui Chou and Joseph J. Martin. *Industrial and Engineering Chemistry*, v. 49, Apr. 1957, p. 758-762.

9841 The Determination of Diffusion Coefficients for Sparingly Soluble Gases in Liquids. J. F. Davidson and E. J. Cullen. *Institution of Chemical Engineers, Transactions*, v. 35, no. 1, 1957, p. 51-60.

Technique consists of measuring the rate of absorption of the gas in liquid flowing over a sphere, and is equivalent to using a short wetted wall column. The diffusion coefficients of CO_2, N_2O, Cl, O, and H were determined in the range 15 to 30 C.

9842* (Russian.) Dissociation Mechanism of Diatomic Molecules During Adsorption on the Surface of a Semi-Conductor. **Mekhanizm dissotsiatsii dvukhatomnoi molekuly pri adsorbtsii na poverkhnosti poluprovodnika.** F. F. Vol'kenstein. *Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk*, no. 2, Feb. 1957, p. 143-156.

A study of adsorption of a diatomic molecule consisting of atoms having one valence electron each. The free electron of the lattice causes a rupture of the valence bond between the atoms, forming the molecule and a sorption of the dissociation products.

9843* (Russian.) Determination of Coefficients of Self-Diffusion of I and K Ions in Alkali Haloid Crystals Exposed to X-Rays. **Issledovanie koeffitsientov samodiffuzii ionov I i K v shchelochno- galoidnykh kristallakh, obluchennykh rentgenovymi luchami.** V. V. Mumladse. *Izvestiia Akademii Nauk SSSR, Seriia Fizicheskaia*, v. 21, Jan. 1957, p. 158-159.

Diffusion coefficients were measured at 450 and 500 C. In both cases the coefficients were smaller in the irradiated specimens, and decreased with temperature.

9844 The Effect of Catalyst Granule Size on the Hydrogenation of Benzene Over a Supported Nickel Catalyst. R. F. Burke, R. L. Motard, L. N. Canjar, and R. B. Beckmann. *Journal of Applied Chemistry*, v. 7, Mar. 1957, p. 105-109.

With increasing state of sub-division, the experimental velocity constant k_s, is proportional to the external surface area of the catalyst down to a certain granule size. Further sub-division has no effect on activity as, when the critical granule size is reached, a sufficient area is exposed so that all of the catalyst is absorbed on the surface of the carrier.

9845 Electrical Resistivity of Cyclohexane as a Function of Temperature and Water Concentration. Peter Staudhammer and William F. Seyer. *Journal of Applied Physics*, v. 28, Apr. 1957, p. 405-410.

9846 On the Application of the Molecular Orbital Method to the Spectra of Substituted Aromatic Hydrocarbons. Lionel Goodman, Ian G. Ross, and Harrison Shull. *Journal of Chemical Physics*, v. 26, Mar. 1957, p. 474-480.

9847 Density of Liquid He^4. Eugene C. Kerr. *Journal of Chemical Physics*, v. 26, Mar. 1957, p. 511-514.

Density measurements between 1.2 and 4.4 K.

9848 Electrolytic Hydrogen Evolution Kinetics and Its Relation to the Electronic and Adsorptive Properties of the Metal. B. E. Conway and J. O'M. Bockris. *Journal of Chemical Physics*, v. 26, Mar. 1957, p. 532-541.

9849 Ionization Potentials of Some Molecules. K. Watanabe. *Journal of Chemical Physics*, v. 26, Mar. 1957, p. 542-547.

Ionization potentials of 89 molecules were determined by photoionization measurements and compared with those obtained by spectroscopic and electron impact methods.

9850 Kinetics of Reaction Between Hydrogen and Nitrogen Dioxide. Willis A. Rosser Jr. and Henry Wise. *Journal of Chemical Physics*, v. 26, Mar. 1957, p. 571-576.

The stoichiometry of the reaction corresponds closely to: $H_2 + NO_2 = NO + H_2O$. Experimental observations are interpreted in terms of a chain mechanism involving H atoms and hydroxyl radicals as chain carriers.

9851 Raman and Infrared Spectra of 2-Thiabutane. Michiro Hayashi, Takehiko Shimanouchi, and San-Ichiro Mizushima. *Journal of Chemical Physics*, v. 26, Mar. 1957, p. 608-612.

In the gaseous and liquid states both the *trans* and *gauche* isomers exist, of which only the former persists in the crystalline state. These isomers have nearly the same energy in the gaseous and liquid states.

9852 Infrared Spectra of the Alkali Halides. I. Lithium Halides. William Klemperer and Stuart A. Rice. *Journal of Chemical Physics*, v. 26, Mar. 1957, p. 618-624.

The vibrational frequencies are calculated from the observed spectra to be LiI ω_e=501 cm^{-1}; LiBr ω_e=576 cm^{-1}; LiCl ω_e=662 cm^{-1}.

9853 Dissociation Energies of Carbon Monoxide and Nitrogen From Reflected Shock Wave Studies. J. P. Toennies and E. F. Greene. *Journal of Chemical Physics*, v. 26, Mar. 1957, p. 655-662.

An acceleration of the reflected shock in N and CO is attributed to vibrational relaxation in the incident shock.

9854 Rotation-Vibration Spectra of Methyl Amine and Its Deuterium Derivatives. Allan P. Gray and R. C. Lord. *Journal of Chemical Physics*, v. 26, Mar. 1957, p. 690-705.

9855 Electronic Spectra of Cyclic Aromatic Hydrocarbon Radicals and Ions. H. C. Longuet-Higgins and K. Lenore McEwen. *Journal of Chemical Physics*, v. 26, Apr. 1957, p. 719-723.

Spectra of a series of cyclic unsaturated radicals and ions containing from three to eight C atoms were calculated by a semi-empirical molecular orbital method.

9856 Spectra of the Alkali Halides. III. Electronic Spectra of Lithium Chloride, Lithium Bromide, and Lithium Iodide. R. Stephen Berry and William Klemperer. *Journal of Chemical Physics*, v. 26, Apr. 1957, p. 724-726.

9857 Microwave Spectrum and Structure of Sulfuryl Fluoride. David R. Lide, Jr., D. E. Mann, and R. M. Fristrom. *Journal of Chemical Physics*, v. 26, Apr. 1957, p. 734-739.

9858 Solubility of Hydrogen and Deuterium in Nonpolar Solvents. M. W. Cook, D. N. Hanson, and B. J. Alder. *Journal of Chemical Physics*, v. 26, Apr. 1957, p. 748-751.

Data on eight solvents from −25 to +35 C show that deuterium is about 2.5% more soluble. Thermodynamic functions are calculated.

9859 Infrared and Raman Spectra of *Trans*-Difluorodichloroethylene. D. E. Mann and Earle K. Plyler. *Journal of Chemical Physics*, v. 26, Apr. 1957, p. 773-779.

9860 Mass Spectrum and Vapor Pressure of Pentaborane-d_9. I. Shapiro and J. F. Ditter. *Journal of Chemical Physics*, v. 26, Apr. 1957, p. 798-801.

9861 Diffusion of Nickel in Nickel Oxide. Moon Taik Shim and Walter J. Moore. *Journal of Chemical Physics*, v. 26, Apr. 1957, p. 802-806.

Diffusion coefficients for Ni in polycrystalline and monocrystalline Ni oxides were measured by the surface-activity method from 1000 to 1400 C in air.

9862 Polymeric Gaseous Species in the Sublimation of Molybdenum Trioxide. J. Berkowitz, Mark G. Inghram, and W. A. Chupka. *Journal of Chemical Physics*, v. 26, Apr. 1957, p. 842-846.

Mass spectrometric analysis of the vapor in thermodynamic equilibrium with powdered MoO_3, as sampled from a Knudsen effusion cell, has shown that the vapor phase consists predominantly of Mo_3O_9, Mo_4O_{12} and Mo_5O_{15} molecules. Individual heats of sublimation were determined to be 80.5 ± 1.5, 93.6 ± 1.6 and 105.6 ± 3.5 kcal. per mole respectively at 850 K.

9863 Potential Constants of Nitrous Acid. Ann Palm. *Journal of Chemical Physics*, v. 26, Apr. 1957, p. 855-859.

The most probable range for the potential constants was established by means of bond order criteria and distributions of potential and kinetic energies among the internal coordinates.

9864 On the Theory of Oxidation-Reduction Reactions Involving Electron Transfer. II. Applications to Data on the Rates of Isotopic Exchange Reactions. III. Applications to Data on the Rates of Organic Redox Reactions. R. A. Marcus. *Journal of Chemical Physics*, v. 26, Apr. 1957, p. 867-877.

9865 Diffusion and Exchange of Zinc in Crystalline Zinc Oxide. Etalo A. Secco and Walter J. Moore. *Journal of Chemical Physics*, v. 26, Apr. 1957, p. 942-948.

Measurements between 900 and 1025 C.

9866 (French.) The Mechanism of Semiconductor Catalytic Action. **Sur le mécanisme de l'action catalytique des semiconducteurs.** T. Wolkenstein. *Journal de Chimie Physique*, v. 54, Feb. 1957, p. 181-184.

Shows that chemical adsorption on the surface of a semiconductor can be interpreted by considering the semiconductor as a free polyradical, while the reaction is stimulated by the free valences.

9867 (French.) A Contribution to the Study of Surface Potentials of Fatty Acids. **Contribution a l'étude des potentiels de surface des acides gras. I.** Measuring Methods. **Méthodes de mesure. II.** Surface Potentials of Myristic Acid. **Potentiels de surface de l'acide myristique. III.** Study of the Transition Areas. **Étude des régions de transition. IV.** Surface Potentials of Lauric Acid Films Obtained by Spreading and by Adsorption. **Potentiels de surface des films d'acide laurique obtenus per étalement et par adsorption.** J. Michel. *Journal de Chimie Physique*, v. 54, Mar. 1957, p. 206-230.

9868 Studies in Aluminium Soaps. II. Mono- and Di-Soaps of Aluminium. K. C. Pande and R. C. Mehrotra. *Journal of Inorganic and Nuclear Chemistry*, v. 4, Mar. 1957, p. 128-130.

9869 The Effect of Solubilization on the Equivalent Conductance and Reduced Viscosity of a Polysoap Derived From Poly-2-Vinylpyridine. Ulrich P. Strauss and Stanley S. Slowata. *Journal of Physical Chemistry*, v. 61, Apr. 1957, p. 411-414.

9870 Thermoluminescence of Fourteen Alkali Halide Crystals. Louis F. Heckelsberg and Farrington Daniels. *Journal of Physical Chemistry*, v. 61, Apr. 1957, p. 414-418.

Thermoluminescence of halides from liquid air temperature to red heat were measured after exposure of the crystals to X-ray or γ-radiation.

9871 Vapor Pressure Studies Involving Solutions in Light and Heavy Waters. IV. Separation Factor and Crossover Temperature for Salt Solutions of the Mixed Waters and for a Mixture of the Pure Waters From 100° to the Critical Temperature. Robert L. Combs and Hilton A. Smith. *Journal of Physical Chemistry*, v. 61, Apr. 1957, p. 441-447.

The addition of a salt to the mixed waters was found to lower the separation factor and the crossover temperature.

9872 Interfacial Tension and Complex Formation. Edward A. Heintz and David N. Hume. *Journal of Physical Chemistry*, v. 61, Apr. 1957, p. 462-465.

A critical review of the Kazi and Desai interfacial tension method gave results which were too erratic and unreliable to allow correlation with solution composition.

9873* (Russian.) Investigation of the Solution-Vapor Equilibrium in the System Benzene-Cyclohexane-Methyl Alcohol. **Issledovanie ravnovesiia rastvor-par v sisteme benzol-tsik logeksan-metilovyi spirt.** A. G. Morachevskii and E. G. Komarova. *Leningradskogo Universiteta, Vestnik Seriia Fiziki i Khimii*, v. 12, no. 4, 1957, p. 118-126.

9874* Light Scattering by Colloidal Systems. An Annotated Bibliography. Myer M. Fishman. 84 p. 1957. Technical Service Laboratories, River Edge, N. J. (ZQD549 F53L Ref.)

Contains 858 references.

9875* (Italian.) The Structure of Glyoxime in the Solid State. **Sulla struttura della gliossima allo stato solido.** M. Milone and E. Borello. *Nuovo Cimento*, v. 5, ser. 10, Mar. 1957, p. 562-571.

Infra-red spectra suggest a centrosymmetrical structure.

9876 The Growth of Lead Nitrate Crystals From Aqueous Solution. Anne P. Williams. *Philosophical Magazine*, v. 2, ser. 8, Mar. 1957, p. 317-322 + 2 plates.

9877 On the Formation and Properties of Helical Dislocations. S. Amelinckx, W. Bontinck, W. Dekeyser, and F. Seitz. *Philosophical Magazine*, v. 2, ser. 8, Mar. 1957, p. 355-378 + 1 plate.

Factors influencing the development of helical dislocations in CaF_2.

9878 The Electronic Structure and Spectra of Some Nitrogen Heterobenzenes. R. McWeeny and T. E. Peacock. *Physical Society, Proceedings*, v. 70, no. 445A, Jan. 1957, p. 41-50.

9879 Thermal Conductivity of Binary and Ternary Rare Gas Mixtures. B. N. Srivastava and S. C. Saxena. *Physical Society, Proceedings*, v. 70, no. 448B, Apr. 1957, p. 369-378.

Data on the mixtures Ne-A, Ne-Kr, A-Kr, and Ne-A-Kr, measured at 38 C for various concentrations by using the "thick wire" variant of the "hot wire" method.

9880 Melting and Freezing of *p*-Toluidine. Gerald W. Sears. *Physics and Chemistry of Solids*, v. 2, Mar. 1957, p. 37-43.

A perfect face of a *p*-toluidine platelet can be heated appreciably above its melting point in contact with its own melt without detectably melting.

9881 Chemical Kinetics in the Past Few Decades. Cyril Hinshelwood. *Science*, v. 125, Apr. 12, 1957, p. 679-682.

Unimolecular, chain, and thermal - decomposition reactions; energy distribution; reactivity and structure; living cells.

9882* (English.) **Isomerisation of Unsaturated Fatty Acid Esters. I. The Effect of Certain Catalysts Upon the Migration of the Double Bond.** J. J. A. Blekkingh, H. J. J. Janssen, and J. G. Keppler. **II. Location of Double Bonds by Oxidative Degradation Methods.** J. G. Keppler. *Recueil des Travaux Chimiques des Pays-Bas*, v. 76, Jan. 1957, p. 35-57.

9883 The Hydrogen Bond—A Review of the Present Position. C. A. Coulson. *Research*, v. 10, Apr. 1957, p. 149-159.

9884 (Czech.) Computing the Increments of Solution Boiling Points. **Výpočet zvýšení bodu varu roztoků.** K. Sýkora and Hradec Králové. *Strojírenství*, v. 7, Mar. 1957, p. 186-190.

Simplified method for computing the increase in temperature of boiling points of sugar solutions can be generally applied to a wide range of different solutions encountered in industry.

9885 The Non-Stoichiometry of Uranium Hydride. George G. Libowitz. *Tufts University (U. S. Atomic Energy Commission)*, NYO-7544, Feb. 1957, 10 p. (UF767 U3ny Contin.)

Non-stoichiometry is due to H vacancies in the lattice rather than interstitial U atoms. The energy necessary to form a vacancy was found to be 68.2 kcal. per mole, while a value of 6.5 kcal. per mole was determined for the interaction energy between vacancies.

9886* (Russian.) Effect of Physico-Chemical Factors on the Frontal Course of the Oxidation Reactions of Arsenite by Iodate. **Vliianie fiziko-khimicheskikh factorov na frontalnoe techenie reaktsii okisleniia arsenita iodatom.** N. S. Shub. *Ukrainskii Khimicheskii Zhurnal*, v. 23, no. 1, 1957, p. 22-26.

Rate of linear reaction between arsenite and iodate. Effect of concentration and temp. Relation between pH and direction of the reaction movement.

9887* (Russian.) Kinetics and Mechanism of the Iodination of Aromatic Aminosulfonic Acids in Aqueous Solutions. **Kinetika i mekhanism iodirovaniia aromaticheskikh aminosul'fokislot v vodnykh rastvorakh.** A. N. Kurakin and E. A. Shilov. *Ukrainskii Khimicheskii Zhurnal*, v. 23, no. 1, 1957, p. 31-53.

Discusses kinetics of iodination of four aromatic amino sulfonic acids in aqueous solution with and without buffer salts, only ions, not the free acids, were subjected to iodination. A general kinetic equation for the iodination of dimethyl-metanilic, diethyl--metanilic, and dimethyl-sulfanilic acids is given.

9888 Thermodynamic Properties of Titanium - Oxygen Solutions and Compounds. Alla D. Mah, K. K. Kelley, Norma L. Gellert, E. G. King, and C. J. O'Brien. *U. S. Bureau of Mines, Report of Investigations* 5316, Mar. 1957, 33 p. (TN21 Un3r)

9889* (German.) Determination of Molecular Weight of Gases and Vapors in High Vacuum. **Molekulargewichtsbestimmung von Gasen und Dämpfen im Hochvakuum.** H. Klumb and S. Dümmler. *Vakuum-Technik*, v. 6, Feb. 1957, p. 1-5.

A manometer for direct measurement of mol. wt. of gases and vapors is described.

9890* (German.) Raman Spectrum and the Dipole Moment of Trimethyliodosilane. **Das Raman-Spektrum und Dipolmoment von Trimethyljodsilan.** J. Goubeau and H. Sommer. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 289, Feb. 1957, p. 1-4.

Comparison of data with that obtained from analogous Cl and Br compounds. Physical constants are tabulated.

9891* (German.) Oscillation Spectra of Certain Sulfuric Acid Derivatives. **Schwingungsspektren einiger Derivate der Schwefelsäure.** Hans Siebert. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 289, Feb. 1957, p. 15-28.

Presents infra-red spectra of $NaNH_2SO_3$, $K_2NH(SO_3)_2$ and $Na_3N(SO_3)_2 \cdot 12\ H_2O$.

9892* (German.) Light Absorption of Dipole Complexes of III-Valency Titanium of the $(TiA_6)^{3+}$-Type With $A=H_2O$, CH_3OH, C_2H_5OH, and $(NH_2)_2CO$. **Über die Lichtabsorption von Dipolkomplexen des III-wertigen Titans vom Typ $(TiA_6)^{3+}$ mit $A=H_2O$, CH_3OH, C_2H_5OH und $(NH_2)_2CO$.** H. Hartmann, H. L. Schläfer, and K. H. Hansen. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 289, Feb. 1957, p. 40-65.

Describes the preparation of hexaurea-Ti(III)-iodide, $[Ti(urea)_6]I_3$. Gives data of magnetic and X-ray investigation of the above.

9893* (English.) **Kinetics of Crystallization. III.** W. J. Dunning and N. T. Notley. *Zeitschrift für Elektrochemie*, v. 61, no. 1, 1957, p. 55-59.

Rates of nucleation of crystalline cyclonite in aqueous acetone. Variations of the rate with supersaturation, solvent composition, and temperature.

9894* (German.) Photoelectric Examinations of Surfaces of Silver Bromide Crystals. **Photoelektrische Untersuchungen an Oberflächen von Silberbromidkristallen.** R. Matejec. *Zeitschrift für Elektrochemie*, v. 61, no. 2, 1957, p. 281-285.

The changes of the surface potential of silver bromide crystals caused by heating, exposure to light, sensitizing, etc. were measured by the Thomson condensator method in comparison with pure Ag.

9895* (Russian.) The Reaction of Tin Chlorides, Bromides and Iodides With Some Aliphatic Alcohols. **Vzaimodeistvie khlornogo, bromogo, i iodnogo olova s nekotor'ymi alifaticheskimi spirtami.** Iu. N. Vol'nov. *Zhurnal Fizicheskoi Khimii*, v. 31, Jan. 1957, p. 133-138.

Reactions with methyl, *n*-propyl, *n*-butyl, and isoamyl alcohols were studied by a cryoscopic method of physicochemical analysis.

9896* (Russian.) Phases of the Na_3AlF_6-Li_3AlF_6 System. **Fazy v sisteme Na_3AlF_6-Li_3AlF_6.** M. S. Beletskii and Iu. G. Saksonov. *Zhurnal Neorganicheskoi Khimii*, v. 2, Feb. 1957, p. 414-416.

The study of a system of lithium and sodium cryolites did not confirm the existence of a simple eutectic or of a continuous series of solid solutions.

See also: **9473** (crystallography of gramicidin S derivatives); **9583** (time-temperature cooling curves); **9637** (system Pd-H-acid); **10082** (semiconductor catalysts); **10767** (effect of gas dissociation on heat transfer); **10839** (coagulation of an aerosol).

COATINGS

9897 Vinyl Acetate Emulsion Copolymer Vehicles. John F. Palmer, Jr. and Robert A. Carr. *American Paint Journal*, v. 41, Apr. 15, 1957, p. 16 + 11 pages.

Formulation, testing, physical properties, and effects of processing variables on vehicles containing dibutyl fumarate and dibutyl maleate.

9898 Coatings. M. H. Swann, M. L. Adams, and G. G. Esposito. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 2, p. 624-630.

Recent developments in coating analysis are reviewed.

9899 Carbon Replica Technique for Examination of Paint Surfaces in Electron Microscopy. William R. Lasko. *Analytical Chemistry*, v. 29, May 1957, p. 784-786.

The use of a water-soluble plastic as the primary replica with evaporated C as the final replica, followed by shadowing, is described.

9900* Susceptibility of Matrix Constituents of Antifouling Paints to Microbial Attack in Sea Water. Robert L. Starkey. *Canadian Journal of Microbiology*, v. 3, Suppl., Mar. 1957, p. 231-238.

Determinations of O consumption as an index of microbial attack and of weight losses were both similar, and reflected the rate of decomposition. Ester gum and Pentalyn compounds did not decompose.

9901 Sprayed Metal as a Base for Paints. Herbert S. Ingham. *Corrosion*, v. 13, Apr. 1957, p. 252t-256t.

Considers surface preparations and the effect sprayed metal coatings have on the application, appearance, and performance of the paints applied over them.

9902 Growth of Silicon Crystals by a Vapor Phase Pyrolytic Deposition Method. R. C. Sangster, E. F. Maverick, and M. L. Croutch. *Electrochemical Society, Journal*, v. 104, May. 1957, p. 317-319.

Crystals are deposited by the reaction of gaseous SiBr with H_2 at the surfaces of hot Si seed filaments.

9903 Influence of Heat Treatment on the Properties of Chemical Nickel Coatings Produced by the Kanigen Process. Van Royen. *Electroplating and Metal Finishing*, v. 10, Apr. 1957, p. 114-115.

Annealing at 400 C produces coatings of sufficient hardness to be competitive with hard chrome. Annealing at 750 C produces maximum corrosion resistance, while treatment at 600 C gives a compromise between maximum hardness and maximum ductility.

9904* (Russian.) Crystallization of Monocrystalline Layers of Silicon and Germanium From Gaseous Phase. **Kristallizatsia monokristallicheskikh sloev kremniia i germaniia iz gazovoi fazy.** N. N. Sheftal, N. P. Kokorish, and A. V. Krasilov. *Izvestiia Akademii Nauk SSSR, Seriia Fizicheskaia*, v. 21, Jan. 1957, p. 146-152 + 6 plates.

At the present time, the best method of growing monocrystalline layers—considering the high quality of the growth obtained as well as the simplicity of the apparatus—is that of crystallizing Si and Ge at atmospheric pressure by decomposing $SiCl_4$ and $GeCl_4$ at a high temperature in a current of H. (Method of Krasilov, Maklakov, and Melnikov). Conditions such as the preparation of surface, orientation and temperature, were established under which a high-grade growth of Ge and partially of Si could be obtained.

9905* (Hungarian.) Hot Tinning of Gray Castings. **Szürke öntvények tüzi ónozása.** Ernõ Hauszner. *Kohászati Lapok*, v. 11, Nov.-Dec. 1956, p. 255-260.

Manufacturing procedure. Comparison with electrolytically deposited tin coatings.

9906* (Russian.) Anti-Corrosion Treatment of Galvanized Articles. **Antikorrozionnaia obrabotka otsinkovannykh detalei.** N. A. Solov'ev and A. A. Gorbenko. *Metallovedenie i Obrabotka Metallov*, no. 2, Feb. 1957, p. 54-58.

Discussion of a process for increasing anti-corrosive property of galvanized articles by treating with a solution of Cr anhydride, H_2SO_4, and HCl.

9907* (French.) Galvanization by the Continuous Process. **La galvanisation en continu.** *Métallurgie et la Construction Mécanique*, v. 89, Mar. 1957, p. 249-251.

Principles; heat treatment of sheet iron; chemical reactions; coating procedures.

9908* Reevaluation of the Function of Pigments in Paints. Adolf C. Elm. *Official Digest. Federation of Paint and Varnish Production Clubs*, v. 29, Apr. 1957, p. 351-385.

Hiding power; yellowing of interior finishes; water resistance and washability; seeding and chalking of metal protective paints.

9909 Technical Pentaerythritols and Their Impurities. S. Gourley and W. Dunlop. *Oil & Colour Chemists' Association, Journal*, v. 40, Apr. 1957, p. 247-270.

Outlines differences in quality that may occur, in commercial pentaerythritols, and their probable effects on resins and coatings.

9910 Formation of Luminescent Films by Evaporation. Charles Feldman and Margaret O'Hara. *Optical Society of America, Journal*, v. 47, Apr. 1957, p. 300-305.

Luminescent films of ZnS [Mn], Zn_2SiO_4 [Mn], $Zn_3(PO_4)_2$ [Mn], CaF_2 [Mn], and $CaWO_4$ [W] were formed by evaporation in a vacuum and a subsequent heat treatment. Most of the films may be made either transparent or fogged, depending on the post-heat treatment.

9911* "Statistics" and the Coatings Chemist. Herman B. Wagner. *Organic Finishing*, v. 18, Apr. 1957, p. 8-12.

The application of statistics to chemical experimentation.

9912* Science for the Coatings Technologist. VII. Blue and Violet Pigments. E. S. Beck. *Organic Finishing*, v. 18, Apr. 1957, p. 16-25.

9913* Aqueous Coatings. Philip Heiberger. *Paint Industry Magazine*, v. 72, Mar. 1957, p. 36 + 22 pages.

A critical review of aqueous vehicles, pigments in aqueous suspensions, and latex paint formulation with special emphasis on unsolved problems in emulsion systems.

9914* Cold Hardening of Epoxy Coatings With Amino Compounds. *Paint and Varnish Production*, v. 47, Apr. 1957, p. 41-48.

Five cold hardening systems are compared.

9915* Pigment Colors for Paint. II. Oranges and Yellows. George Wormald. *Paint and Varnish Production*, v. 47, Apr. 1957, p. 53-56.

Advantages and disadvantages of various orange and yellow pigments.

9916 Improved Method to Measure the Thickness of Thin Films With a Photoelectric Ellipsometer. A. Rothen. *Review of Scientific Instruments*, v. 28, Apr. 1957, p. 283-285.

9917 (French.) The Chemical Oxidation of Light Metals by Alodine 100. **L'Oxydation chimique des métaux légers par l'alodine 100.** Jean-Jacques Meynis de Paulin. *Revue de l'Aluminium*, v. 34, Feb. 1957, p. 187-195.

Bath composed largely of H_3PO_4, H_2CrO_4, and Fl provides quickly, under hot temperature conditions, or in a few minutes in the case of cold work, a blue-green film of amorphous double phosphate of Cr and Al. Bath composition and operation, properties of the treated surfaces, and adhesion of the film are discussed.

9918* (French.) Processes of Automatic Galvanizing Control Applied to a Heurtey-Sendzimir Continuous Sheet Mill. **Procédés de réglage automatique d'une ligne continue de galvanisation Heurtey-Sendzimir.** A. Doye. *Silicates Industriels*, v. 22, Feb. 1957, p. 87-94.

Description, application, and advantages of a continuous galvanizing process with two types of furnace. Study of the adjustment and guiding of the sheet and automatic temperature control.

9919 (German.) Behavior of Copper in Steel During Scaling and Its Effect on Hot-Dip Zinc-Coating of Steel Wires. **Verhalten des Kupfers im Stahl während der Verzunderung und seine Wirkung bei der Feuerverzinkung von Stahldrähten.** Clemens Eisenhuth, Wolfgang Gruhl, Werner Papsdorf, and Irmgard Eisenhuth. *Stahl und Eisen*, v. 77, Mar. 21, 1957, p. 354-359.

Investigation of Cu distribution in steel specimens containing 0.7% C and 0.38% Cu as dependent on the degree of scaling. Behavior of the Cu when annealing in an A atmosphere. Effect of the molten Zn on Cu content in the marginal zone.

9920* (German.) Protection Against Oxidation in Molybdenum Used at High Temperatures. **Schutz von Molybdän vor Oxydation bei hohen Temperaturen.** Karl Wassmann. *VDI Zeitschrift*, v. 99, Apr. 1957, p. 421-422.

The use of Mo in an oxidizing atmosphere at temperatures above 800 C is limited because of the rate of oxidation. Anticorrosive measures consist in the production of coatings that prevent oxidation or form stable oxides that stop further progress of the oxidation.

9921* (German.) Metallizing, Today and Tomorrow. **Der gegenwärtige Stand und die Entwicklungsrichtungen des Metallspritzens.** Hans von Hofe. *VDI Zeitschrift*, v. 99, Apr. 1957, p. 425-426.

Metallizing equipment including oxy-acetylene and electric-arc atomizers. High frequency atomizers are not ready for industrial use. Applications.

9922 Fundamental Studies on the Adhesion of Organic Materials to Metal Substrates. R. L. Patrick and W. A. Vaughan. *Wright Air Development Center Aeronautical Research Laboratory, WADC Technical Report* 56-663, Dec. 1956, 78 p. (TL507 Un3.18w Vis.)

Investigates the controlling factors which influence the bonding of adhesives and protective coatings to metal surfaces. Includes a bibliography of 119 annotated entries.

9923* (German.) Polymorphy and Pseudomorphy in Thin Evaporated Coatings. **Zur Poly- und Pseudormorphie in dünnen Aufdampfschichten.** Heinz Lüdemann. *Zeitschrift für Naturforschung*, v. 12a, Mar. 1957, p. 226-228 + 1 plate.

A study of thin TlCl and CsCl layers, normally condensing in the CsCl lattice type and growing on single crystals of alkali halide of the NaCl type. Lattice constants and symmetry are not enough to explain the complex crystal growth. The relationship between the structural element of the layer and its base must be examined in each case.

9924* (Russian.) Diffusion Method of Cu Coating. **Diffuznoe mednenie.** N. S. Gorbunov and A. G. Latukhova. *Zhurnal Prikladnoi Khimii*, v. 30, Jan. 1957, p. 81-83.

Coating of iron by using a Cu-powder/Al_2O_3 mixture in a flowing stream of H.

9925* (Czech.) Electrical Metallizing in Production and Repairing. **Elektrická metalisace ve výrobě a opravárenství.** Vladimír Ninger. *Zváranie*, v. 6, Mar. 1957, p. 84-88.

Advantages of an electric process applied to metallizing metallic parts. Apparatus and method used.

See also: **10012** (coatings for electroplating equipment); **10116** (review of paint industry); **10469** (embrittlement of steel by phosphate coating); **10514** (phosphate coatings); **10551** (structure of Sn plate coating); **10803** (PVC coatings for Fe and Al); **10902** (electroless plated brazing alloys).

CONTROL SYSTEMS, COMPUTERS, AND SYSTEMS ENGINEERING

9926* (English.) **A High-Speed Electronic Arithmetic Unit for Automatic Computing Machines.** Morton Nadler. *Acta Technica*, v. 1, no. 6, 1956, p. 464-478 + 7 plates.

Basis of the method is the separation of the addition and carry clearing operations in binary arithmetic, so that accumulation may proceed at the rate of one addition per phase, followed by a single carry-clearing step. Carry clearing over 64 places can be performed in μ sec. by a pyramidal carry-clearing circuit.

9927* A Synthesis Method for Multipole Control Systems. Herbert Freeman. *Applications and Industry*, no. 29, Mar. 1957, p. 28-31.

Method is based on the application of certain system constraints which reduce the degrees of freedom of the system without resulting in an undue restriction on system performance.

9928* A New Stability Criterion of Linear Servomechanisms by a Graphical Method. Toshio Numakura and T. Miura. *Applications and Industry*, no. 29, Mar. 1957, p. 40-48.

9929 A Résumé of the Development and Literature of Nonlinear Control-System Theory. T. J. Higgins. *ASME, Transactions,* v. 79, Apr. 1957, p. 445-453.

9930 Electrohydraulic Servomechanism With an Ultra-high-Frequency Response. D. P. Eckman, C. K. Taft, and R. H. Schuman. *ASME, Transactions,* v. 79, Apr. 1957, p. 455-463.

9931 Representation of Nonlinear Functions of Two Input Variables on Analog Equipment. D. A. Elliott. *ASME, Transactions,* v. 79, Apr. 1957, p. 489-495.

A graphical method of matching three-dimensional functions by the use of standard analog components without modifications.

9932 Basic Methods for Nonlinear Control-System Analysis. T. M. Stout. *ASME, Transactions,* v. 79, Apr. 1957, p. 497-508.

9933 Design and Analog-Computer Analysis of an Optimum Third-Order Nonlinear Servomechanism. H. G. Doll and T. M. Stout. *ASME, Transactions,* v. 79, Apr. 1957, p. 513-525.

9934 Physical and Mathematical Mechanisms of Instability in Nonlinear Automatic Control Systems. R. E. Kalman. *ASME, Transactions,* v. 79, Apr. 1957, p. 533-566.

Particular attention is paid to the effects of system parameters and system inputs in provoking or destroying instability.

9935* Short Runs and Job Lots With Tape and Card Controlled Machines. J. H. McRainey. *Automation,* v. 4, May 1957, p. 83-91.

A general picture of the status of numerical control of machine tools as a guide to designers and users concerned with short runs and job lot operations.

9936 The Logical Design of a Digital Computer for a Large-Scale Real-Time Application. M. M. Astrahan, B. Housman, J. F. Jacobs, R. P. Mayer, and W. H. Thomas. *Communication and Electronics,* Mar. 1957, p. 71-75.

9937 Static Switching Devices—New Tools for Industrial Control. Robert A. Mathias. *Control Engineering,* v. 4, May 1957, p. 67-94.

Basic logic and fundamentals of magnetic and semi-conductor switching devices; survey of commercially available equipment; analytical case studies of a wide variety of applications; system design tips; costs.

9938 Checking Techniques for Digital Computers. R. W. Hamming. *Control Engineering,* v. 4, May 1957, p. 111-114.

The principle of redundancy in checking. Error detecting and correcting codes. Problems of human errors in coding and programming.

9939* Predicting Temperature Rise in Servo Motors. Robert M. Gitlin and Sidney A. Davis. *Electrical Manufacturing,* v. 59, Apr. 1957, p. 133 + 13 pages.

Includes thermal conductivities and heat transmission values for numerous metals and nonmetallic materials.

9940 A High-Speed Data Processing System. M. L. Klein, R. B. Rush, and H. C. Morgan. *Electronic Engineering,* v. 29, Apr. 1957, p. 158-163.

System holds up to 4,800,000 eighteen-bit words on magnetic tape. Data are obtained from 100-input analog signals at a rate of 10,000 words per sec.

9941* A 32,000-Word Magnetic-Core Memory. E. Foss and R. S. Partridge. *IBM, Journal of Research and Development,* v. 1, Apr. 1957, p. 102-109.

Development of the IBM 738 magnetic core storage unit. Associated engineering problems, including the electrical and mechanical arrangements for packaging more than one million magnetic cores and their circuits. Driver circuits and sense amplifier.

9942* The Multipurpose Bias Device. I. The Commutator Transistor. B. Dunham. *IBM, Journal of Research and Development,* v. 1, Apr. 1957, p. 116-129.

A study of the Rutz commutator transistor largely in application to three-input and one-output logical situations.

9943* Addressing for Random-Access Storage. W. W. Peterson. *IBM, Journal of Research and Development,* v. 1, Apr. 1957, p. 130-146.

Estimates are made of the amount of searching required for the exact location of a record in several types of storage systems, including the index-table method of addressing and the sorted-file method. Detailed data and formulas for access time are given for an "open" system which offers high flexibility and speed of access.

9944* A Mathematical Model for Determining the Probabilities of Undetected Errors in Magnetic Tape Systems. M. Schatzoff and W. B. Harding. *IBM, Journal of Research and Development,* v. 1, Apr. 1957, p. 177-180.

9945 The Application of a Computer to Refinery Problems. B. D. Dagnall and P. Mayers. *Institute of Petroleum, Journal,* v. 43, Apr. 1957, p. 115-123.

Calculation of the optimum operating conditions of a plant. Simulation of the operation of proposed new equipment by computer.

9946 The Describing-Function Analysis of a Non-Linear Servo Mechanism Subjected to Stochastic Signals and Noise. P. N. Nikiforuk and J. C. West. *Institution of Electrical Engineers, Proceedings,* v. 204, pt. C, Mar. 1957, p. 193-203.

9947 Programming a Computer. Martin L. Klein, Frank K. Williams, and Harry C. Morgan. *Instruments and Automation,* v. 30, Apr. 1957, p. 671-676.

Basic steps in programming the ALWAC III-E computer.

9948* Operational Electronic Analog Computers. Hugo M. Martinez. *ISA Journal,* v. 4, Apr. 1957, p. 141-144.

Accuracy considerations; applications in data processing and in simulation.

9949 Automatic Testing Devices Save Time, Build Reliability. R. K. McDevitt. *Military Electronics,* v. 2, Apr. 1957, p. 10-14.

Automation techniques including card-controlled programmer, automatic calibration, and digital readouts, reduce errors and test time on fire control systems by 80%.

9950* A Very Fast Pulse-Height Analyser With Independent Uptake Sorting and Storage of Information. R. V. Gasström. *Nuclear Instruments,* v. 1, Mar. 1957, p. 75-79.

9951* An Electronic Reactor Simulator. Ross Cameron and D. A. Austin. *Nuclear Power,* v. 2, Apr. 1957, p. 146-151.

In the design stages of a reactor, the analog computer provides a rapid and economical method of solving complex performance calculations.

9952 A Basic Manual of Routines for the 650. E. M. Kidd. *Union Carbide Nuclear Company (U. S. Atomic Energy Commission),* K-1322, Mar. 1957, sections individually paged. (UF767 Un3.1k Contin.)

Routines for magnetic drum calculator.

9953 Investigation of a Nonlinear Control System. I. Flügge-Lotz and C. F. Taylor. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3826, Apr. 1957, 92 p. (TL570 Un3t)

A discontinuous variation of coefficients of the differential equation describing the linear control system before nonlinear elements are added is studied in detail. The nonlinear feedback is applied to a second-order system.

See also: **9407** (wind tunnel data handling); **10040** (binary block coding); **10166** (computer for gas network flow problems); **10228** (machine information systems).

ELECTRICAL ENGINEERING

9954* Analysis of Irregular Current and Voltage Wave Shapes Found in Industrial Power Engineering. R. H. Kaufmann. *Applications and Industry,* no. 29, Mar. 1957, p. 1-5.

9955* Testing the Electric Strength of Liquid Dielectric or Insulating Material. J. A. Kok and M. M. G. Corbey. *Applied Scientific Research*, v. 6, sec. B, 1957, p. 285-295.

Poor quality hydrocarbon oil was purified by means of an electrostatic Cottrell filter which removed most of the foreign particles of high dielectric constant. The one-hour breakdown strength was increased from about 10 to 60 kv. per mm.

9956 Electrical Adjustment in Fitting a New Output Transformer. Norman H. Crowhurst. *Audio*, v. 41, Apr. 1957, p. 19 + 5 pages.

9957 The Analysis of Finite-Length Records of Fluctuating Signals. M. J. Tucker. *British Journal of Applied Physics*, v. 8, Apr. 1957, p. 137-142.

Considers the problem of estimating the characteristics of a signal from a record of finite length by Fourier-type analysis or by direct measurement.

9958 Reliability of Redundant Switches. Obert B. Moan. *Control Engineering*, v. 4, May 1957, p. 107-108.

Charts show probabilities of system success for various levels of component performance.

9959 A Wind-Operated Electric Power Supply. W. A. Marrison. *Electrical Engineering*, v. 76, May 1957, p. 418-421.

Device has only one moving part, may be operated without servicing under a wide range of weather conditions.

9960* Terminal Stud Assembly for Maximum Reliability. G. H. Lines. *Electrical Manufacturing*, v. 59, Apr. 1957, p. 101-103.

Loose terminals in terminal board assemblies can seriously affect the reliability of electronic equipment. Assemblies of tubular rivet-type terminal studs in phenolic and silicone laminates were investigated to determine suitable mounting hole tolerances and to evaluate the effect of knurling of terminal shanks.

9961* Characteristics of Metal-Clad Laminates. D. S. Hoynes. *Electrical Manufacturing*, v. 59, Apr. 1957, p. 104 + 7 pages.

Design data on several types of metal-insulated laminates for printed circuit work. Current-carrying capacity, electrical resistance of coated laminates, and dielectric properties.

9962 The Electrical Production of Music. Alan Douglas. 223 p. 1957. Philosophical Library, New York. (ML1092 D74e)

The physics of musical instruments; musical scales and intervals; noise and starting transients; electrical tone or waveform generators, electrical tone formation; loud speakers; existing limitations and possible future trends of research.

9963 Electricity and Magnetism. J. Newton. 613 p. 1956. Philosophical Library, New York. (QC518 N48e)

Theory; current measurements; electrolysis; electrodynamics; machines; thermoelectricity; electronic tubes.

9964 Electric Power Distribution for Industrial Plants. 2nd Ed. 172 p. 1956. American Institute of Electrical Engineers, New York. (TK3141 Am35e2 Over.)

Basic information needed to determine approximate load requirements of industrial plants, type of distribution system, distribution voltages, and voltage regulation, as well as information to assist the engineer in the selection of transformers, circuit breakers, relays, meters, fuses, cables, bus and miscellaneous equipment needed in the design of an adequate electric distribution system for present and future load conditions.

9965* (Czech.) Developments in Insulation for Electric Machine Windings. **Pokroky v isolaci vinutí elektrických strojů.** Daniel Mayer. *Elektrotechnik*, v. 12, Mar. 1957, p. 76-82.

Use of synthetic materials in electronics. Increasing importance of Si and materials based on it. New types of insulation, such as mylar, resins, cements, and varnishes based on epoxides.

9966* (Slovak.) Measuring the Dielectric Losses of Insulating Oils. **Meranie dielektrických strát izolačných olejov.** Ján Artbauer. *Elektrotechnik*, v. 12, Mar. 1957, p. 87-90.

Possible sources of errors in various measuring methods.

9967* Synthetic Fluids for Transformer Cooling. II. Design and Application of "Pyroclor" Filled Transformers. P. D. Wilmot and N. G. H. Thomas. *Engineer*, v. 203, Mar. 22, 1957, p. 451-452.

Fluid is a mixture of hexachlorodiphenyl and trichlorobenzene.

9968* Determination of Transient Stability Limits of a Synchronous Motor Due to Sudden Load Variation. II. S. Ganapathy. *Indian Institute of Science, Journal*, v. 39, sec. B, Jan. 1957, p. 1-16.

The relationship between initial load on the shaft and the corresponding limiting load can be predetermined with a minimum amount of numerical computation.

9969* (Flemish.) Dielectric Losses of Crystals With Pin Point Net Defects. **Dielektrische verliezen van kristallen met roosterdefekten.** G. Jacobs. *Industrie Chimique Belge*, v. 22, Mar. 1957, p. 295-306.

General survey of the results obtained up to now.

9970* Arc Interruption. II. Theory and Experiment on Gap Recovery. H. Edels and F. W. Crawford. *Institution of Electrical Engineers, Journal*, v. 3, Feb. 1957, p. 88-93.

Methods for the determination of breakdown characteristics; experimental data on gap recovery.

9971 Hall Effect and Its Counterpart, Radiation Pressure, in Microwave Power Measurement. H. E. M. Barlow. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. C, Mar. 1957, p. 35-42.

Hall effect and radiation pressure are shown to be different manifestations of the same basic phenomenon, and their relationship is deduced for a plane wave transmitted through a slab of material of given electrical characteristics.

9972 Characteristics of the Trigatron Spark-Gap. A. M. Sletten and T. J. Lewis. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. C, Mar. 1957, p. 54-61.

9973 Theory and Equivalent Circuits of the Double Induction Regulator. C. S. Jha. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. C, Mar. 1957, p. 96-107.

9974 The Production of a Sinusoidal Flux Wave, With Particular Reference to the Inductor Alternator. N. N. Hancock. *Institution of Electrical Engineers, Proceedings*, v. 204, pt. C, Mar. 1957, p. 167-173.

9975* The Magnetostatic Characteristics of Two Non-Magnetic Elliptic Cylinders. E. E. Jones. *Journal of Mathematics and Physics*, v. 35, Oct. 1956, p. 266-277.

9976 Dielectric Constant Measurements on Gases at Microwave Frequencies. James E. Boggs, Cullen M. Crain, and James E. Whiteford. *Journal of Physical Chemistry*, v. 61, Apr. 1957, p. 482-484.

Determinations were made on 15 gases at 30, 60, and 90 C using a frequency of 9400 Mc.

9977 Linear Transient Analysis. v. II. Two-Terminal-Pair Networks Transmission Lines. Ernst Weber. 452 p. 1956. John Wiley & Sons, New York. (TK3226 W38L)

Mathematical analysis of transient phenomena in passive and active two-terminal-pair networks, filters, and transmission lines.

9978 Electrical Insulation Materials. A. J. Monack. *Materials & Methods*, v. 45, Apr. 1957, p. 145-160.

A survey of the major types of solid insulation materials and their electrical, mechanical, and thermal properties. Discussion covers all common forms: films, sheets and slabs, tapes, sleeving and flexible tubing, rigid tubing, rods, and moldings.

9979 The Acoustical Design of Enclosures, for Power Transformers. T. D. Northwood, L. B. Smith, and E. J. Stevens. *Noise Control*, v. 3, Mar. 1957, p. 37 + 3 pages.

9980 Physical Basis for Electrical Engineering. Thomas L. Martin, Jr. 410 p. 1957. Prentice-Hall, Englewood Cliffs, New Jersey. (QC521 M36p)

Electrostatic and magnetic fields in vacuum; nuclear and extranuclear atomic structure; structure and behavior of metals and semiconductors; semiconductor devices; electron tubes; insulators and capacitors; magnetic properties of matter; inductance.

9981 Directional Effects in the Electric Breakdown of Single Crystals of KCl and NaCl. R. Cooper, D. T. Grossart, and A. A. Wallace. *Physical Society, Proceedings*, v. 70, no. 446B, Feb. 1957, p. 169-176.

Measurements between −200 and +230 C suggest that the mechanism of breakdown is dependent on the properties of high-energy conduction electrons.

9982 Dipole Moment Fluctuations of a Dielectric Body. B. K. P. Scaife. *Physical Society, Proceedings*, v. 70, no. 447B, Mar. 1957, p. 314-319.

The case of a dielectric which has two mechanisms of polarization (orientational and displacement) is considered.

9983* Determination of Impulse Stresses Within Transformer Windings by Computers. J. H. McWhirter, C. D. Fahrnkopf, and J. H. Steele. *Power Apparatus and Systems*, no. 28, Feb. 1957, p. 1267-1274.

9984* Effects on Transformer Insulation Structures of Long-Duration Waves Representative of Switching Surges. H. E. Fiegel and J. S. Kresge. *Power Apparatus and Systems*, no. 28, Feb. 1957, p. 1312-1320.

9985* The Solution of Power System Stability Problems by Means of Digital Computers. D. L. Johnson and J. B. Ward. *Power Apparatus and Systems*, no. 28, Feb. 1957, p. 1321-1329.

9986* Speed Control of Induction Motors Using Saturable Reactors. P. L. Alger and Y. H. Ku. *Power Apparatus and Systems*, no. 28, Feb. 1957, p. 1335-1341.

By means of amplistats, feedback control circuits, and saturable reactors, a standard wound-rotor motor can give adjustable constant-speed performance similar to a Ward-Leonard d.c. drive over the complete range from + 100 to −100% of normal torque.

9987 Factors Influencing Starting Duty of Large Induction Motors. V. J. Picozzi. *Power Engineering*, v. 61, Apr. 1957, p. 96-99.

9988 Torque Motors and Brakes. S. Noodleman. *Product Engineering*, v. 28, Apr. 1957, p. 146-151.

Speed-torque characteristics, ratings, frame sizes, and variable-voltage controls for braking, clamping, indexing, traversing, and tension.

9989* (German.) The Transfer Function of the DC Motor With Thyratron Governed Armature. **Die Übertragungsfunktion des Gleichstrommotors mit thyratrongesteuertem Anker.** W. Steiger. *Regelungstechnik*, v. 5, no. 2, 1957, p. 45-49.

9990 Instrumentation for High-Field Conductance Measurements. F. R. Kotter. *Review of Scientific Instruments*, v. 28, Mar. 1957, p. 178-181.

An improved differential pulse transformer bridge. Circuit for current distortion studies. Four-terminal resistance measuring equipment.

9991 Electroluminescence—A Laboratory Curiosity Approaches Practicality. Henry F. Ivey. *Westinghouse Engineer*, v. 17, May 1957, p. 93-96.

This fourth basic type of light source may revolutionize lighting techniques if it can achieve its full potential.

9992* (German.) Dielectric Constants of Barium Titanate at 10 GHz. **Dielektrizitätskonstante von Bariumtitanat bei 10 GHz.** Hans Jürgen Schmitt. *Zeitschrift für Angewandte Physik*, v. 9, Mar. 1957, p. 107-111.

The dielectric constant of $BaTiO_3$ was determined as a function of temperature. Measurements were made in a tubular conductor at a frequency of 9400 MHz.

9993* (German.) Superconductive Niobium Compounds. **Über supraleitende Verbindungen des Niob.** Erich Schröder. *Zeitschrift für Naturforschung*, v. 12a, Mar. 1957, p. 247-256.

A study of superconductivity in 15 Nb-N specimens of variable N contents.

See also: **9519** (electrical properties of ceramic material); **9939** (temperature increase in motors); **10052** (analyzer for transmission lines); **10359** (electric arc applications); **10453** (Cu commutator segments); **10478** (superconductivity of Sn); **10483** (Te-alloy cable sheath); **10496** (properties of Pb cable sheathing); **10614** (field stabilization of electromagnet); **10750** (superconductivity of Hg); **10769** (conductivity of ZnO); **10782** (fluorocarbon insulators).

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9994 Electrochemical Fission of the Carbon - Fluorine Bond. *p*H-Dependency of the Process. Philip J. Elving and Joseph T. Leone. *American Chemical Society, Journal*, v. 79, Apr. 5, 1957, p. 1546-1550.

9995 Conductance Studies of Organometallic Chlorides of Group IVB and of Hydrogen Chloride in N,N-Dimethylformamide. Some Observations About the Purification of the Solvent. Alvin B. Thomas and Eugene G. Rochow. *American Chemical Society, Journal*, v. 79, Apr. 20, 1957, p. 1843-1848.

9996* (English.) **Electrochemical Study of the Ethylene Glycol-Acetic Acid System.** V. K. Venkatesan and C. V. Suryanarayana. *Chemical Society of Japan, Bulletin*, v. 30, Jan. 1957, p. 97-100.

Equivalent conductivity, volume contraction, viscosity, dielectric constant, and refractometric measurements of mixtures of ethylene glycol and acetic acid at different percentage compositions were made.

9997* (English.) **Electrodeposition From Sulphamate Solutions. IV. Cadmium.** J. Mathur and T. L. Rama Char. *Electrochemical Society, Bulletin of India Section*, v. 6, Jan. 1957, p. 6-10.

Optimum conditions for deposition are established.

9998 A Reproducible and Stable Silver - Silver Oxide Electrode. Walter J. Hamer and D. Norman Craig. *Electrochemical Society, Journal*, v. 104, Apr. 1957, p. 206-211.

The standard electrode potential is −0.342 v. at 25 C.

9999 Electroless Nickel Plating for Making Ohmic Contacts to Silicon. Miles V. Sullivan and John H. Eigler. *Electrochemical Society, Journal*, v. 104, Apr. 1957, p. 226-230.

Technique whereby an adherent plate of Ni may be deposited on Si for use as an electrical contact. The contact may be used on either *n*- or *p*-type Si.

10000 The Kinetics and Mechanism of Formation of Anode Films on Single-Crystal InSb. J. F. Dewald. *Electrochemical Society, Journal*, v. 104, Apr. 1957, p. 244-251.

10001 Tin Plating From the Pyrophosphate Bath. J. Vaid and T. L. Rama Char. *Electrochemical Society, Journal*, v. 104, May 1957, p. 282-287.

The complex $Sn_2P_2O_7$ bath gave good quality deposits over a wide range of experimental conditions. Addition agents like dextrin-gelatin increased the brightness of the deposits.

10002 The Mechanism of Titanium Production by Electrolysis of Fused Halide Baths Containing Titanium Salts. J. G. Wurm, Lucien Gravel, and Roger J. A. Potvin. *Electrochemical Society, Journal*, v. 104, May 1957, p. 301-308.

Titanium was produced by electrolyzing a molten bath of NaCl and KCl mixture containing K_2TiF_6 and Na_2TiF_6.

10003 Galvanic Cells for the Determination of the Standard Molar Free Energy of Formation of Metal Halides, Oxides, and Sulfides at Elevated Temperatures. Kalevi Kiukkola and Carl Wagner. *Electrochemical Society, Journal*, v. 104, May 1957, p. 308-316.

10004 Non-Equilibrium Diffuse Double-Layer. M. J. Sparnaay. *Faraday Society, Transactions*, v. 53, Mar. 1957, p. 306-314.

Calculations on the basis of the Gouy-Chapman theory show that the potential distribution and the capacity of the diffuse double layer are in practical cases only slightly altered if a d.c. or a.c. is passing through a non-polarized electrode.

10005 Influence of Turbulence Upon Electrokinetic Phenomena. Experimental Determination of the Thickness of the Diffuse Part of the Double Layer. A. J. Rutgers, M. de Smet, and G. de Myer. *Faraday Society, Transactions*, v. 53, Mar. 1957, p. 393-396.

10006* Applications of Nickel Plating. *Industrial Finishing (London)*, v. 9, Mar. 1957, p. 443 + 4 pages.

Procedure for producing a sound deposit; some specialized applications.

10007 The Chromium Plating of Gun Barrels. R. A. F. Hammond. *Institute of Metal Finishing, Bulletin*, v. 7, Spring 1957, p. 83-110.

10008 (French.) A New Method for Measuring the Double Electric Layer Capacity. **Nouvelle méthode de mesure de la capacité de double couche électrique.** J. Guizerix, P. Levéque, and M. Renou. *Journal de Chimie Physique*, v. 54, Feb. 1957, p. 162-167.

A simple and practical method giving the static capacity value calculated for the Hg electrode and the classic Hg dropping electrode. Results are comparable to those obtained by other methods.

10009 Transference in Binary Molten Salt Solutions. Benson Ross Sundheim. *Journal of Physical Chemistry*, v. 61, Apr. 1957, p. 485-486.

The coupling between diffusion and electrical conduction is treated for a solution of two molten salts having an ion in common.

10010 Electrolytic Refining of Titanium. R. S. Dean. *Light Metal Age*, v. 15, Apr. 1957, p. 20-22.

Basic feature of new process is a new electrolyte containing the two lower chlorides of Ti and a significant concentration of dissolved alkali metal. This enables Ti to be dissolved at the anode and crystallized adherent to, but not deposited on, the cathode.

10011* (English.) **Further Study on the Second Virial Coefficient in Polyelectrolyte Solutions With Extraneous Salts.** Hiroshi Inagaki, Sadakatsu Hotta, and Matsuo Hirami. *Makromolekulare Chemie*, v. 23, no. 1, 1957, p. 1-15.

The second virial coefficient and the intrinsic viscosity in the solution of sodium carboxymethyl cellulose were studied using 2 to 1 electrolytes as the extraneous salt.

10012 Coatings for Protection of Electroplating Equipment. Michael Perez. *Metal Finishing*, v. 55, Apr. 1957, p. 62-64.

Coatings available; application methods. Curing plastisol coatings.

10013 Surface Treatment and Finishing of Light Metals. XIID. Plating on Aluminum—The Vogt Process. S. Wernick and R. Pinner. *Metal Finishing*, v. 55, Apr. 1957, p. 68-71.

Process produces an electrodeposited Zn film with certainty irrespective of the composition or construction of the Al components. After final plating with Ni and before Cr plating, the components are subjected to heat treatment.

10014 The Anodizing and Brightening of Aluminium and Its Alloys. Influence of Composition and Structure. A. W. Brace. *Metallurgia*, v. 55, Apr. 1957, p. 173-185.

10015* (Italian.) Electrodeposition of Sn-Ni and Sn-Sb Alloys. **Elettrodeposizione di leghe Sn-Ni e Sn-Sb.** G. Serravalle. *Metallurgia Italiana*, v. 49, Feb. 1957, p. 99-106.

10016 Microthrowing Power. A Literature Search. Esther B. Leffler and Henry Leidheiser, Jr. *Plating*, v. 44, Apr. 1957, p. 388-396.

Review of pertinent experimental work on microthrowing power and leveling, and of theoretical work concerned with deposition within isolated recesses and cavities.

10017* The Testing and Examination of Electrodeposits. R. Quarendon. *Product Finishing*, v. 10, Apr. 1957, p. 65-73.

Electromagnetic, reflectometer, non-magnetic, and radiation methods; various techniques for average thickness determination.

10018* (Czech.) Possibilities of Electrolytic Polishing for Metallographic Examination. **Možnosti elektrolytického leštenia liatiny pre metalografické pozorovanie.** Ivan Hrivňák. *Slévárenství*, v. 5, Mar. 1957, p. 80-82.

Difficulties in electrolytic polishing of cast iron. A method of alternate mechanical and electrolytic polishing in an electrolyte comprising 133 ml. CH_3COOH + 29 g. CrO_3 + 7 ml. water.

10019* (Russian.) Energy Balance of the Aluminum Bath. **Ob energeticheskom balanse aliuminievoi vanny.** V. V. Krivoruchenko and B. S. Gulianitskii. *Tsvetnye Metally*, v. 30, Mar. 1957, p. 47-51.

After the calculated balance of the aluminum electrolyzer has been determined, the interpolar distance should be ascertained. If this distance is to large, the insulation will have to be improved to prevent excessive heat loss.

10020 Electrowinning Chromium Metal. J. B. Rosenbaum, R. R. Lloyd, and C. C. Merrill. *U. S. Bureau of Mines, Report of Investigations* 5322, Mar. 1957, 58 p. (TN21 Un3r)

Principal novel features of the process are the chromealum electrolyte and a unitized diaphragm cell which incorporates a conventional cell tank, simple assembly and controls, and wide latitude in selection of construction materials for handling highly corrosive electrolytes.

10021 Electrochemical Preparation of Boron. Nelson F. Murphy, Richard S. Tinsley, and George F. Meenaghan. *Virginia Polytechnic Institute, Bulletin, Engineering Experiment Station Series No.* 115, v. 50, Feb. 1957, 18 p. (TN21 V81b Vis.)

Electrolysis of the Na_2O-$NaBF_4$-B_2O_3 molten salt bath at about 800 to 850 C and 1.0 amp. per sq. cm. using iron cathode and graphite rod anodes is recommended as a method for preparation of elemental boron.

10022* (German.) Electric Conductivity in Electrolytes at High Field Intensity. Boundary Effect. Higher Concentrations. **Elektrische Leitfähigkeit in Elektrolyten bei hohen Feldstärken. Grenzeffekt. Höhere Konzentrationen.** Wilhelm Fucks and Klaus Tesch. *Zeitschrift für Physik*, v. 148, no. 1, 1957, p. 53-60.

Measurement of the increase of electrical conductivity of aqueous $MgSO_4$ solution in relation to the field intensity. Comparison of experimental data with the theoretical results of Wilson and Folkenhagen-Kelbg.

10023* (Russian.) The Electrochemical Oxidation and Reduction of Some Organic Compounds at the Rotating Disc Electrode. **Elektrokhimicheskoe okislenie i vosstanovlenie nekotorykh organicheskikh soedinenii na vrashchaiushchemsia diskovom elektrode.** E. A. Aikazyan and Iu. V. Pleskov. *Zhurnal Fizicheskoi Khimii*, v. 31, Jan. 1957, p. 205-213.

The kinetics of the anodic oxidation of hydroquinone and ethyl and butyl alcohols and of the cathodic reduction of quinone were investigated. The oxidation rate of ethanol and butanol on Pt at sufficiently high positive potentials is limited by the activated adsorption step and decreases with increasing anodic polarization.

10024* (Russian.) Bright Ni-Plating. **Blestiashchee nikelirovanie.** A. M. Ozerov. *Zhurnal Prikladnoi Khimii*, v. 30, Jan. 1957, p. 62-72.

Effect of various types of electric current on plating characteristics.

10025* (Russian.) Dimension Changes of Al Alloys During Anodic Oxidation. **Ob izmenenii razmerov izdelii iz aliuminievykh splavov pri anodnom oksidirovanii.** A. V. Shreider. *Zhurnal Prikladnoi Khimii*, v. 30, Jan. 1957, p. 84-97.

Effect of temperature of the electrolyte, the method of surface preparation, and the shape of the surfaces on dimension changes.

10026* (Russian.) Dependence of the Anodic Potential of Steel on the Electrolyte Composition During Electro-Chemical Polishing. **Zavisimost' anodnogo potentsiala stali ot sostava elektrolita pri elektrokhimicheskom polirovanii.** N. P. Fedot'ov and S. Ia. Grilikhes. *Zhurnal Prikladnoi Khimii*, v. 30, Feb. 1957, p. 233-239.

Formation of salt and oxide layers determine the limits of current, as shown by curves of the anodic potential. The increase of the reflecting ability of steel anode as a function of temperature. Effect of Cr ions on electrochemical polishing.

10027* (Russian.) Electrochemical Formation of Zinc on Aluminum Cathodes With a Differently-Finished Surface. **Elektrokhimicheskoe vydelenie tsinka na aliuminievykh katodakh s razlichno obrabotannoi poverkhnost'iu.** D. P. Zosimovich and T. I. Kononchuk. *Zhurnal Prikladnoi Khimii*, v. 30, Feb. 1957, p. 240-248.

The basic factor determining the linking of Zn with Al is the presence or absence of the oxide layer on the surface of Al. Effect of F ions on the velocity of layer formation, and consequently on linking of metals.

10028* (Russian.) Electrolytic Copper Plating From Ammonium Electrolyte for the Purpose of Protecting Steel Surfaces During Cementation. **Elektrolitícheskoe mednenie iz ammiachnogo elektrolita dlia tselei mestnoi zashchity poverkhnosti stal'nykh izdelii v protsesse tsementatsii.** N. A. Marchenko. *Zhurnal Prikladnoi Khimii*, v. 30, Feb. 1957, p. 248-255.

Ammonium electrolyte can successfully be used for copper-plating steel surfaces, thus preventing them from carburization. Composition of electrolyte is suggested and anode and cathode current densities are given.

See also: **9645** (analysis of Zn plating bath); **9646** (analysis of Ni plating bath).

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10029 Effect of a Negative Impedance Source on Loudspeaker Performance. Richard E. Werner. *Acoustical Society of America, Journal*, v. 29, Mar. 1957, p. 335-340.

A direct radiator moving coil loudspeaker driven by an amplifier whose output impedance approaches the negative of the blocked voice-coil impedance can be made to exhibit extended L.F. response with reduced distortion.

10030* Signal Detection as a Function of Signal Intensity and Duration. David M. Green, Theodore G. Birdsall, and Wilson P. Tanner, Jr. *Acoustical Society of America, Journal*, v. 29, Apr. 1957, p. 523-531.

Studies of audible pure tones partially mashed by random noise.

10031* (German.) Elementary Mechanism of Cold Electron Emission in Solids. **Zur Frage des Elementarmechanismus der kalten Elektronen-emission bei den Festkörpern.** Antonín Bohun. *Acta Physica Austriaca*, v. 10, no. 4, 1957, p. 353-364.

Effects of external and internal factors such as pressure, heat, radiation, and their combinations on cold electron emission from solid, and especially non-metallic bodies.

10032 (English.) **Switching Time in P-N Junction Diodes With Built-In Drift Field.** N. I. Meyer. *Acta Polytechnica (Physics Including Nucleonics Series)*, v. 3, no. 9, 1957, 32 p. (Tl Ac81 Vis.)

The transient response of the drift diode is studied. Analytical and numerical results for the hole storage current as a function of time are obtained for the case where the diode is suddenly switched from the forward to the reverse direction. Switching time for the drift diode may be reduced by more than a factor of four as compared to the corresponding diffusion diode.

10033* A Study of the Transfer Function of Contact-Modulated Amplifiers. F. H. Krantz, O. M. Salati, and R. S. Berkowitz. *Applications and Industry*, no. 29, Mar. 1957, p. 23-28.

10034* (German.) Forward-Scatter Observations at 50 Mc/sec. **Forward-Scatter-Beobachtungen bei 50 MHz.** Klaus Bibl, Hanns A. Hess, and Karl Rawer. *Archiv der Elektrischen Übertragung*, v. 11, Feb. 1957, p. 59-62.

Field strength measurements on V.H.F. scatter propagation at 51.3 Mc. per sec. were performed with a 10 kw. continuous wave transmitter and a special receiver of 70 c.p.s. bandwidth over two different distances, one of about 500 km. and the other of 1000 km. c.p.s.

10035 A Cascode Amplifier for Phono Preamps. Joseph Marshall. *Audio*, v. 41, Apr. 1957, p. 26 + 2 pages.

A comparative analysis of the advantages and disadvantages of the cascode as a preamplifier.

10036* Transistorized Microphone Preamplifier and Remote Broadcast Mixer-Amplifier. William D. Bevitt. *Audio Engineering Society, Journal*, v. 4, Oct. 1956, p. 181-185.

10037 An Experimental Dual Polarization Antenna Feed for Three Radio Relay Bands. R. W. Dawson. *Bell System Technical Journal*, v. 36, Mar. 1957, p. 391-408.

Fundamental problems with coupled-wave transducers which operate over a three to one frequency band were explored and usable solutions found.

10038 The Character of Waveguide Modes in Gyromagnetic Media. H. Seidel. *Bell System Technical Journal*, v. 36, Mar. 1957, p. 409-426.

The effect of birefringence is studied in rectangular and circular wave guides with special attention paid to propagation characteristics in guides of arbitrarily small cross-section.

10039 Sensitivity Considerations in Microwave Paramagnetic Resonance Absorption Techniques. G. Feher. *Bell System Technical Journal*, v. 36, Mar. 1957, p. 449-484.

Factors which limit the sensitivity of microwave paramagnetic resonance equipment in several specific systems are analyzed.

10040 Binary Block Coding. S. P. Lloyd. *Bell System Technical Journal*, v. 36, Mar. 1957, p. 517-535.

Based on the belief that it is possible to signal over an error-making binary channel with arbitrarily small probability of error in the delivered information.

10041* Principles of the Light-Amplifier and Allied Devices. T. B. Tomlinson. *British Institution of Radio Engineers, Journal*, v. 17, Mar. 1957, p. 141-154.

The system outlined consists of a photoconducting layer in series with an electroluminescent phosphor layer. Properties of constituent parts and behavior of the series combination are considered.

10042* An Experimental Study of Some Fading Characteristics of 10-CM Waves in the Scatter Region. D. G. Kiely, S. J. Robinson, and F. C. Chesterman. *British Institution of Radio Engineers, Journal*, v. 17, Mar. 1957, p. 161-171.

10043 Magnetically Keyed, Phase-Sensitive Demodulators. Robert B. Mark, Wheeler X. Johnson, and Paul R. Johannessen. *Communication and Electronics*, Mar. 1957, p. 1-6.

Details of demodulator circuits in which saturable reactors, transistors, and silicon diodes are used in place of vacuum tubes to obtain increased reliability and ruggedness, small physical size, and low noise level.

10044 Rectilinearity of Electron-Beam Focusing Fields From Transverse Component Determinations. P. P. Cioffi. *Communication and Electronics*, Mar. 1957, p. 15-19.

Transverse field determination provide a sensitive method of evaluating the degree of rectilinearity.

10045 Transistorized Phase Discriminators. Albert N. DeSautels. *Communication and Electronics*, Mar. 1957, p. 19-26.

Considers half-wave and full-wave phase discriminators which use transistors and diodes to produce phase-sensitive d.c. output capable of driving a magnetic amplifier or energizing relays, heating coils, and hydraulic valves.

10046 Self-Balancing Magnetic Amplifiers of the Differential-Feedback Type. William A. Geyger. *Communication and Electronics*, Mar. 1957, p. 39-46.

Application of differential-feedback circuitry to push-pull self-balancing magnetic amplifiers in order to obtain extreme stability and freedom from zero drift with a minimum of core matching and component selection.

10047 Characteristics and Applications of the Latron Storage Tube. Dean W. Davis. *Communication and Electronics*, Mar. 1957, p. 47-53.

The properties of image storage and extremely high brightness at low voltage make the tube very attractive for radar indicators, oscilloscopes, and other uses.

10048* (French.) Electric and Optic Properties of Aluminum Antimonide. Effect of Lithium. **Propriétés électriques et optiques de l'antimoniure d'aluminium, action du lithium.** François Kover and Andrée Quilliet. *Comptes Rendus*, v. 244, Mar. 25, 1957, p. 1739-1741.

When AlSb samples were doped with Li, samples gave results similar to those from more pure specimens. This was due to vacancies in the Sb that could be filled with interstitial Li atoms.

10049* (French.) The Current-Voltage Characteristics of Metal-Germanium Contact Rectifiers. **Sur les caractéristiques courant-tension des contacts redresseurs métal-germanium.** Guy Mesnard and Alexandre Dolce. *Comptes Rendus*, v. 244, Apr. 8, 1957, p. 2025-2028.

The variation of the height of the potential barrier at the metal-germanium contact, as a function of the voltage applied, indicated a rapid increase of the current for inverse peak voltages.

10050* (Russian.) Thermoelectrical Properties of Chromium Silicides. **Termoelektricheskie svoistva silitsidov khroma.** L. N. Guseva and B. I. Ovechkin. *Doklady Akademii Nauk SSSR*, v. 112, Feb. 1, 1957, p. 681-683.

Study of electrical and thermoelectrical properties of chromium silicides reveals existence of two groups: Cr_3Si, Cr_5SI_3, and CrSi having conductivities of metals and $CrSi_2$ which is a semiconductor with an activation energy of 1.3.

10051 Semiconductors, an Outline. W. C. Dunlap, Jr. *Electrical Engineering*, v. 76, May 1957, p. 400-405.

Properties of compound semiconductors; structure and preparation of p-n junctions; device applications.

10052 Electronic Fault Analyzer for Transmission Lines. H. E. McCormack. *Electrical Engineering*, v. 76, May 1957, p. 405-409.

10053* Effect of Radiation on Semiconductors. J. C. Pigg and C. C. Robinson. *Electrical Manufacturing*, v. 59, Apr. 1957, p. 116-124.

When high-energy particle bombardment is part of the environment, circuit designs employing semiconductors must include consideration of the effects of crystal lattice disorder. Changes in characteristics of typical semiconductor components when subjected to various radiation levels are described.

10054 Electrical Conduction in Silicon Carbide. G. H. Fetterley. *Electrochemical Society, Journal*, v. 104, May 1957, p. 322-327.

Commercial SiC is a semiconductor. Body conductivity is linear and determines the behavior of SiC heating elements, which are usually made from the *n*-type. The interfacial conductivity is much lower, nonlinear, and is exploited in lightning arresters, which are made from *p*-type. Conduction mechanisms are outlined.

10055* Transistors Can Be Reliable. C. H. Zierdt, Jr. *Electronic Design*, v. 5, Apr. 1, 1957, p. 22-25.

Improvements in reliability are reported for Si and Ge transistors of both grown and alloy types.

10056* Molded Printed Circuits. *Electronic Design*, v. 5, Apr. 1, 1957, p. 40-43.

Design, processing, and cost data for a typical molded-phenolic printed-circuit panel. Comparison of etched vs. molded panels.

10057 Dynamic Methods of Testing Semi-Conductor Rectifier Elements and Power Diodes. I. A. H. B. Walker and R. G. Martin. *Electronic Engineering*, v. 29, Apr. 1957, p. 150-157.

Suitable electronic instruments are described. (To be continued.)

10058 Microwave Helical Aerials. T. G. Hame. *Electronic Engineering*, v. 29, Apr. 1957, p. 181-183.

Use of the dielectric-enclosed helix extends the high frequency range of the helical aerial throughout the microwave region without loss of performance.

10059* (Slovene.) Measurement of Background Noise of Resistances. **Merjenje šuma ohmskih uporov. I.** Jože Gajšek. *Elektrotehniški Vestnik*, v. 25, Jan.-Feb. 1957, p. 205-208.

Operation and design of device used for measuring resistors of $5k\omega$ and more if loaded up to 500 v. d.c.

10060* (German.) Characteristic Losses of Energy of Electrons in Solid Materials. **Charakteristische Energieverluste von Elektronen im Festkörper.** H. Friedmann. *Fortschritte der Physik*, v. 5, no. 2, 1957, p. 51-69.

Effects of material characteristics and ambient conditions on absorption, reflection, and scattering.

10061* Propagation of Microwaves on a Single Wire. II. S. N. Contractor and S. K. Chatterjee. *Indian Institute of Science, Journal*, v. 39, sec. B, Jan. 1957, p. 52-67 + 2 plates.

Expressions for the longitudinal and transverse impedance were derived from the field components of the E_0 wave with which the surface wave line is excited. A tapered wooden termination fixed with cardboard fins sprayed with graphite was superior as a matching device.

10062 Synthesis of Tchebycheff Parameter Symmetrical Filters. Alexander J. Grossman. *I.R.E., Proceedings*, v. 45, Apr. 1957, p. 454-473.

Design theory of electrically symmetrical reactive (loss-less) networks with particular attention to filters which exhibit Tchebycheff type performance in the pass and stop bands. Step-by-step design procedures, with emphasis on the use of rapidly converging series in the computations in place of elliptic function tables.

10063 A New Semiconductor Photocell Using Lateral Photoeffect. J. Torkel Wallmark. *I.R.E., Proceedings*, v. 45, Apr. 1957, p. 474-483.

Photocell can detect the position of a light spot to less than 100 A. By utilizing an associated lens or aperture, one can measure an angular motion smaller than 0.1 sec. of arc.

10064 Design Considerations for Broad-Band Ferrite Coaxial Line Isolators. B. J. Duncan, L. Swern, K. Tomiyasu, and J. Hannwacker. *I.R.E., Proceedings*, v. 45, Apr. 1957, p. 483-490.

10065 Transistor Junction Temperature as a Function of Time. Kenneth E. Mortenson. *I.R.E., Proceedings*, v. 45, Apr. 1957, p. 504-513.

Analysis of heat flow in transistors enables determination of junction temperature with time for a given transistor excitation.

10066 Study of the Feasibility of Airborne HF Direction-Finding Antenna Systems. Philip S. Carter, Jr. *Institute of Radio Engineers, Transactions on Aeronautical and Navigational Electronics*, v. ANE-4, Mar. 1957, p. 19-23. (TK1 In6.6a Vis.)

Such systems are not feasible except in very restricted circumstances over narrow portions of the H.F. band.

10067 A One-Kilowatt Airborne-Radio-Frequency Power Amplifier. James B. Humfeld. *Institute of Radio Engineers, Transactions on Aeronautical and Navigational Electronics*, v. ANE-4, Mar. 1957, p. 30-34. (TK1 In6.6a Vis.)

Complete oil immersion for heat transfer and voltage insulation plus a novel six-phase self-rectifying power amplifier circuit give a high-power density unit capable of operating under extreme environmental conditions.

10068 Synthesis of Delay Line Networks. D. A. Linden and B. D. Steinberg. *Institute of Radio Engineers, Transactions on Aeronautical and Navigational Electronics*, v. ANE-4, Mar. 1957, p. 34-39. (TK1 In6.6a Vis.)

The required number of delay elements is equal to the number of poles of the *z*-transfer function which are located away from the origin, or to the number of zeros, whichever is larger.

10069 Bandwidth Limitations in Equalizers and Transistor Output Circuits. John L. Stewart. *Institute of Radio Engineers, Transactions on Circuit Theory*, v. CT-4, Mar. 1957, p. 5-9. (TK1 In6.6c Vis.)

10070 Degenerate Solutions and an Algebraic Approach to the Multiple-Input Linear Filter Design Problem. R. M. Stewart and R. J. Parks. *Institute of Radio Engineers, Transac-*

tions on Circuit Theory, v. CT-4, Mar. 1957, p. 10-14. (TK1 In6.6c Vis.)

Three common types of design problems are considered.

10071* Fading of Long-Distance Radio Signals and a Comparison of Space- and Polarization-Diversity Reception in the 6-18Mc/s Range. G. L. Grisdale, J. G. Morris, and D. S. Palmer. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Jan. 1957, p. 39-51.

10072* Frequency-Modulation Distortion in Linear Networks, With Special Application to Minimum-Phase Networks. R. F. Brown. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Jan. 1957, p. 52-62.

10073* Frequency Diversity in the Reception of Selectively Fading Binary Frequency-Modulated Signals, With Special Reference to Long-Distance Radiotelegraphy. J. W. Allnatt, E. D. J. Jones, and H. B. Law. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Mar. 1957, p. 98-110.

10074* An Investigation of the Spectra of Binary Frequency-Modulated Signals With Various Build-Up Waveforms. J. W. Allnatt and E. D. J. Jones. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Mar. 1957, p. 111-116.

10075* High-Temperature Properties of Tungsten Which Influence Filament Temperatures, Lives and Thermionic-Emission Densities. R. N. Bloomer. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Mar. 1957, p. 153-157.

10076 Properties of Synthetic Quartz Oscillator Crystals. C. S. Brown and L. A. Thomas. *Institution of Electrical Engineers, Proceedings*, v. 204, pt. C, Mar. 1957, p. 174-184.

10077* Electronics in Engineering. D. S. Gordon. *Institution of Engineers & Shipbuilders in Scotland, Transactions*, v. 100, pt. 5, 1956-1957, p. 465-504.

An introductory summary, indicating some of the possibilities and limitations of electronic methods, with particular reference to systems of special interest to mechanical engineers and naval architects.

10078 An Introduction to Junction Transistor Theory. R. D. Middlebrook. 296 p. 1957. John Wiley & Sons, New York. (QC544.T3 M58i)

A thorough background for the electronic engineer who is interested in the "how" and the "why" of transistor operation.

10079 Evaporation of Impurities From Semiconductors. K. Lehovec, K. Schoeni, and R. Zuleeg. *Journal of Applied Physics*, v. 28, Apr. 1957, p. 420-423.

Equations are derived for the impurity distribution which arises by evaporation of impurities from the surface of a homogeneously doped semiconductor. The rate of evaporation is assumed to be proportional to the surface concentration.

10080 Influence of Electric Field in Diffusion Region Upon Breakdown in Germanium *n-p* Junctions. E. M. Pell. *Journal of Applied Physics*, v. 28, Apr. 1957, p. 459-466.

10081* Wave-Guide Interpretation of Atmospheric Waveforms. F. Hepburn. *Journal of Atmospheric and Terrestrial Physics*, v. 10, Mar. 1957, p. 121-135.

A graphical construction for the prediction of waveforms, given the source conditions, indicates how the change in shape with reflection order of the ionosphere-reflected pulses can be explained in terms of source effects and the mode responses of an imperfectly conducting infinite parallel-plane wave-guide, whose known propagation characteristics give a qualitative explanation of the diversity of waveforms recorded.

10082 (French.) Different Types of Junction During Chemical Adsorption on Semiconductors. **Sur les différents types de liaison lors de l'adsorption chimique sur des semi-conducteurs.** T. Wolkenstein. *Journal de Chimie Physique*, v. 54, Feb. 1957, p. 175-180.

Studied the various types of junction possible during the chemical adsorption of an atom on an ionic crystal of the MR type (M=metal, R=metalloid) and shows the part played by electrons and holes when taking or not taking part in the junctions.

10083* The Cylindrical Diode. D. A. Bell and H. O. Berktay. *Journal of Electronics*, v. 2, ser. 1, Mar. 1957, p. 425-435.

Properties considered are the current-density neglecting initial velocities; corrections in current-density formula to take account of the initial velocities; the retarding-field characteristic; the empirical treatment of shot-noise in the space charge controlled cylindrical diode.

10084* Evaporation of Barium From Impregnated Cathodes. I. Brodie and R. O. Jenkins. *Journal of Electronics*, v. 2, ser. 1, Mar. 1957, p. 457-476.

Evaporation from cathodes impregnated with Ba aluminate increases rapidly when the BaO-alumina molar ratio exceeds three; addition of CaO reduces these evaporation rates.

10085* Radio Frequency and Scattering Angle Dependence of Ionospheric Scatter Propagation at VHF. Albert D. Wheelon. *Journal of Geophysical Research*, v. 62, Mar. 1957, p. 93-112.

10086* Analysis of a General System for the Detection of Amplitude-Modulated Noise. Emanuel Parzen and Norman Shiren. *Journal of Mathematics and Physics*, v. 35, Oct. 1956, p. 278-288.

10087 Thermal Design in Electronic Equipment. Thomas C. Reeves. *Machine Design*, v. 29, May 2, 1957, p. 84-93.

A practical design guide on solution of heat problems in assemblies employing electronic and electrical components, including thermal design objectives, procedures for minimizing heat generated by components, and techniques for isolating and removing heat efficiently from equipment.

10088* Pulse-Lengthener Circuits. M. A. Meyer. *Nuclear Instruments*, v. 1, Mar. 1957, p. 62-65.

Existing and new circuits which convert pulses of short duration proportionally into flat-topped pulses of which the duration varies from a few tenths of a μ sec. to several sec.

10089* Temperature Coefficients of Scintillating Systems. William P. Ball, Rex Booth, and Malcolm MacGregor. *Nuclear Instruments*, v. 1, Mar. 1957, p. 71-74.

Temperature coefficients of several photomultiplier tube-scintillator combinations and of photomultiplier tubes separately were measured over the temperature range from 5 to 40 C. The coefficients, which are negative, are functions of the temperature.

10090* Transformers in Nuclear Instrumentation. T. P. Lynott. *Nuclear Power*, v. 2, Apr. 1957, p. 135-138.

A résumé of current practice and future trends in design and manufacture of the electronic type of transformer with special reference to atomic energy applications.

10091 Field Effect on an Illuminated Ge Surface and Investigation of the Surface Recombination Process. Shyh Wang and George Wallis. *Physical Review*, v. 105, ser. 2, Mar. 1, 1957, p. 1459-1464.

Surface conductance, photoconductance, and field effect were measured in the Brattain-Bardeen ambient cycle on Ge surfaces etched with CP-4.

10092 Possible Mechanism for Radiationless Recombination in Semiconductors. Leon Bess. *Physical Review*, v. 105, ser. 2, Mar. 1, 1957, p. 1469-1475.

The combination of the radiationless processes will predominate over the radiative one under practically all operating conditions.

10093 CdS - Type Photoconductivity in ZnTe Crystals. Richard H. Bube and Edward L. Lind. *Physical Review*, v. 105, ser. 2, Mar. 15, 1957, p. 1711-1712.

10094 Recombination Radiation From Deformed and Alloyed Germanium *p-n* Junctions at 80°K. R. Newman. *Physical Review*, v. 105, ser. 2, Mar. 15, 1957, p. 1715-1720.

Two bands of radiation are shown. One, which peaks at 0.7 e.v., is an intrinsic property. The second, which peaks at about 0.5 e.v. appears to be characteristic of deformed material or material in which slip has occurred.

10095 Noise in a Molecular Amplifier. M. W. Muller. *Physical Review*, v. 106, ser. 2, Apr. 1, 1957, p. 8-12.

The quantum theory of noise in lossy electrical circuits is applied to microwave molecular amplifiers and predicts a correction to the classically calculated noise figure which can be identified with spontaneous emission from the molecules of the active medium.

10096 Effect of Heavy Doping on the Self-Diffusion of Germanium. M. W. Valenta and C. Ramasastry. *Physical Review*, v. 106, ser. 2, Apr. 1, 1957, p. 73-75.

10097 Microwave Measurements of High Electron Densities. S. J. Buchsbaum and Sanborn C. Brown. *Physical Review*, v. 106, ser. 2, Apr. 15, 1957, p. 196-199.

Method is based on eliminating the effect of a.c. space charge on the probing microwave field. This is accomplished by ensuring that the electric field be everywhere perpendicular to electron-density gradients.

10098 Investigation of the Photoconductive Effect in Lead Sulfide Films Using Hall and Resistivity Measurements. Joseph F. Woods. *Physical Review*, v. 106, ser. 2, Apr. 15, 1957, p. 235-240.

Measurements over the range −41 to +31 C.

10099* (English.) **On Electrical Resistivity and Hall Coefficient of PbTe Crystals.** Kisaburo Shogenji and Susumu Uchiyama. *Physical Society of Japan, Journal*, v. 12, Mar. 1957, p. 252-258.

10100 The Dependence of the Hall Coefficient of a Mixed Semiconductor Upon Magnetic Induction as Exemplified by Indium Antimonide. D. J. Howarth, R. H. Jones, and E. H. Putley. *Physical Society, Proceedings*, v. 70, no. 445B, Jan. 1957, p. 124-135.

10101 Drift of Minority Carriers in the Presence of Trapping. A. K. Jonscher. *Physical Society, Proceedings*, v. 70, no. 446B, Feb. 1957, p. 223-234.

10102 Impact Ionization of Impurities in Germanium. N. Sclar and E. Burstein. *Physics and Chemistry of Solids*, v. 2, Mar. 1957, p. 1-23 + 2 plates.

The low-temperature electrical breakdown effect in Ge is investigated experimentally as a function of the temperature, magnetic field, background radiation, type and concentration of impurities, geometry, surface effects, and orientation of the specimens.

10103 Design, Construction, and High-Frequency Performance of Drift Transistors. A. L. Kestenbaum and N. H. Ditrick. *RCA Review*, v. 18, Mar. 1957, p. 12-23.

10104 The Design of Periodic Permanent Magnets for Focusing of Electron Beams. F. Sterzer and W. W. Siekanowicz. *RCA Review*, v. 18, Mar. 1957, p. 39-59.

10105 Analysis and Synthesis of Transitional Butterworth-Thomson Filters and Bandpass Amplifiers. Yona Peless and T. Murakami. *RCA Review*, v. 18, Mar. 1957, p. 60-94.

Networks have steady-state and transient characteristics which vary smoothly from the Butterworth characteristic (maximally flat amplitude) to that for the Thomson characteristics (maximally flat envelope delay). Synthesis is based on the location of the poles of the transfer function in the complex frequency plane.

10106 Reliability Measurement—How Reliable? Richard R. Landers. *Research & Engineering*, v. 3, Apr. 1957, p. 8 + 4 pages.

An appraisal of present methods of determining reliabilities.

10107 Study of Injecting and Extracting Contacts on Germanium Single Crystals. L. Y. Lin. *Review of Scientific Instruments*, v. 28, Mar. 1957, p. 187-188.

A procedure for preparing reproducible and dependable injecting and extracting contact, in order to obtain a good exponential decay or rise curve of minority carriers for determining their lifetimes by the Many bridge method.

10108 Television Engineering. Principles and Practice. v. III. Waveform Generation. S. W. Amos and D. C. Birkinshaw. 226 p. 1957. Philosophical Library, New York. (TK6630 Am69t)

The application in television of sinusoidal, rectangular, sawtooth, and parabolic waves, and the mathematical relationship between them; fundamental principles of the circuits commonly used to generate such signals.

10109 Television Receiving Equipment. W. T. Cocking. 4th Ed. 454 p. 1957. Philosophical Library, New York. (TK 6653 C64t4)

Treatment is largely-non-mathematical, but assumes a knowledge of ordinary sound-radio technique. Includes theory, design, and operation of various parts and circuits.

10110 The Hall Effect and Its Uses. T. R. Lawson, Jr. *Westinghouse Engineer*, v. 17, May 1957, p. 71-73.

With increased knowledge of semiconductor materials, this laboratory phenomenon has practical applications.

10111* Choosing Radar Wavelengths. R. F. Hansford and R. T. H. Collis. *Wireless World*, v. 63, Apr. 1957, p. 188 + 5 pages.

Relative performance of 10 and 25 cm. for surveillance equipment.

10112* (Russian.) Investigation of the Minority Current Carrier Movement in Germanium. **Izuchenie dvizheniia neosnovnykh nositelei toka v ob'eme germaniia.** M. Shtenbek and P. I. Baranskii. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, Feb. 1957, p. 221-232.

A null method of measuring the mobility of minority carriers in the interior of the semiconductor and excluding surface effects. Method of measuring longitudinal and transverse minority carriers.

10113* (Russian.) Use of Hall-Effect Linear Detector for Measurements. **Opyt primeneniia lineinogo detektora na effekte Kholla dlia izmeritel'nykh tselei.** V. N. Bogomolov and V. D. Vasil'ev. *Zhurnal Tekhnickeskoi Fiziki*, v. 27, Feb. 1957, p. 260-261.

Hall effect detector is linear over a very broad range of amplitudes and is phase sensitive. It does not rsepond to non-signal frequencies induced in the circuit.

See also: **9513** (vanadate glasses as semiconductors); **9516** (low loss Mg-Mn ferrites); **9942** (commutator transistors); **9980** (electronic engineering); **10190** (solar effects on wave propagation); **10192** (R.F. ionosphere reflection coefficients); **10436** (Hall effect in Ti, V, Cr, Mn, Zr, and Hf); **10643** (energy levels in Si); **10745** (properties of Si); **10935** (detectability of radar targets).

ENGINEERING ECONOMICS

10114 Complete Handbook on Foreign Aid. J. Weston Walch. 208 p. 1956. J. Weston Walch, Portland, Maine. (HC 60 W14c)

An analysis of the foreign aid situation is presented as a debate topic, including numerous quotations from recent publications, offered as both affirmative and negative evidence.

10115 Essential Factors in the Future Development of the Oil Industry. George Sell, editor. 176 p. 1956. Institute of Petroleum, London. (HD9560 In7e)

The world outlook for energy demand; prospects for solid, liquid, and gaseous fuels and for hydroelectricity; economics and application of atomic energy; oil demand, resources, and refining techniques; oil's future as a source of chemicals; financial factors in oil development.

10116 The Paint Industry in Perspective. E. A. Bevan. *Paint Manufacture*, v. 27, Apr. 1957, p. 136-142.

Position in relation to other industries, in particular plastics; influence affecting economics, raw materials, and cooperation in the industry; trends in the use of synthetic resins in the past, present, and future.

10117 Preliminary Report. 142 p. 1956. Royal Commission on Canada's Economic Prospects. (HC111 C16p)

Forecasts of population growth and distribution; prospects and problems of the primary resource industries; secondary manufacturing industries; tariff policy, transportations, and capital investment.

10118 Production Forecasting, Planning, and Control. E. H. Mac Niece. 2nd Ed. 374 p. 1957. John Wiley & Sons, New York. (HD31 M23p2)

The author reduces the methods and techniques of production management to a set of principles, then illustrates these principles with specific examples of effective applications. Material on social and economic implications is included.

10119 (French.) Aluminum in Yugoslavia. **L'aluminium Yougoslave.** G. A. Baudart. *Revue de l'Aluminium*, v. 34, Feb. 1957, p. 151-154.

Yugoslavia has very important bauxite reserves and ranks as the number one European exporter of this ore. A long term capacity of 265,000 tons per yr. is planned.

10120 A Saga of Commerce. 85 p. 1947. C. Tennant Sons, & Co., New York. (HF3163.N5 T26s Over.)

A history of the C. Tennant, Sons & Co., New York, a trading company since 1825. The story is interwoven with that of commercial development in the U. S.

See also: **10201** (Maryland water resources).

FLUID MECHANICS

10121 Agitation of Non-Newtonian Fluids. A. B. Metzner and R. E. Otto. *A.I.Ch.E., Journal*, v. 3, Mar. 1957, p. 3-10.

Power requirements for the rapid mixing of non-Newtonian fluids are much greater than for comparable Newtonian materials.

10122 Material Transport in Turbulent Gas Streams: Radial Diffusion in a Circular Conduit. Scott Lynn, W. H. Corcoran, and B. H. Sage. *A.I.Ch.E., Journal*, v. 3, Mar. 1957, p. 11-15.

10123 Mass and Heat Transfer to Single Spheres and Cylinders at Low Reynolds Numbers. S. K. Friedlander. *A.I.Ch.E., Journal*, v. 3, Mar. 1957, p. 43-48.

10124 An Empirical Correlation for Velocity Distribution of Turbulent Fluid Flow. B. F. Ruth and H. H. Lang. *A.I.Ch.E., Journal*, v. 3 Mar. 1957, p. 117-120.

10125 Analysis of Deformation. v. III. Fluidity. Keith Swainger. 266 p. 1956. Chapman and Hall, Ltd., London. (QC191 Sw14a)

The modern approach to fluid mechanics suggests the invalidity of the classical theory of fluids due to inclusion of Euler's nonlinear convective acceleration term. The two approaches are compared in detail.

10126 Applied Mathematics and Mechanics. Jets, Wakes, and Cavities. Garrett Birkhoff and E. H. Zarantonello. v. II. 353 p. 1957. Academic Press, New York. (QC151 B53j)

The most important findings of nearly 100 yrs. of research are summarized systematically. Covers flow theory, hodographs, flow over single and multiple plates, and compressibility and gravity effects.

10127* Analysis of Heat-Driven Oscillations of Gas Flows. I. General Considerations. H. J. Merk. *Applied Scientific Research*, v. 6, sec. A, no. 4, 1957, p. 317-336.

Fundamental ideas underlying the theory of heat-driven oscillations are discussed with reference to a simple model consisting of a tube containing a disk-shaped heat source perpendicular to the axis of the tube.

10128 Flow Through Annular Orifices. K. J. Bell and O. P. Bergelin. *ASME, Transactions*, v. 79, Apr. 1957, p. 593-601.

Coefficients for the annular orifice formed between a circular disk and a cylindrical tube are reported for 21 orifices having disk diameter to tube diameter ratios in the range of 0.95 to 0.996, and orifice length-to-width ratios from 0.118 to 33.3.

10129 Tests of Free Convection in a Partially Enclosed Space Between Two Heated Vertical Plates. Robert Siegel and R. H. Norris. *ASME, Transactions*, v. 79, Apr. 1957, p. 663-673.

Results demonstrate how the surface-temperature rise increases, or the local Nusselt number decreases, as either of the cross-sction dimensions of the free-convection space is reduced.

10130 A Study of Error Effects in Measuring Cyclic-Temperature Heat-Transfer Coefficients. David A. Dingee and Joel W. Chastain. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-1167, Feb. 1957, 25 p. (UF767 U3b Contin.)

Most of the errors at the conditions under study could be explained by velocity mixing. Results indicate that fluids of high density such as water are not suitable fluids for cyclic-temperature tests to obtain convective heat-transfer coefficients.

10131 Steady State Heat Transfer to Fully Developed Turbulent Flow in a Curved Channel. A. W. Marris. *Canadian Journal of Physics*, v. 35, Apr. 1957, p. 410-434.

10132* (French.) An Electric Method for the Measurement of Low Liquid Speeds. **Méthode électrique pour la mesure des faibles vitesses di liquide.** M. Jacques Bonnin. *Comptes Rendus*, v. 244, Mar. 25, 1957, p. 1722-1724.

Low voltage electrodes were arranged in a slow water current and the speed of water measured. The variations of an electric value were renderd linear in proportion to the speed between 0 and 7 cm. per sec. with an average dispersion of 0.25.

10133 Trends in Pipeline Valve Control. H. A. Altorfer. *Instruments and Automation*, v. 30, Apr. 1957, p. 708-714.

Recent progress in the field of semi-automatic and fully automatic control of both plug and gate type valve for oil and gas pipelines.

10134* The Dall Flow Tube. I. O. Miner. *Instrument Engineer*, v. 2, Apr. 1957, p. 45-49.

Head loss of flow-metering device is lower than that for any other known primary device which operates by developing pressures dependent on the acceleration of the fluid. Tube develops a high differential pressure, and is only slightly affected by rounding its sharp edges.

10135 Dissociation Effects in Hypersonic Viscous Flows. Y. H. Kuo. *Journal of the Aeronautical Sciences*, v. 24, May 1957, p. 345-350.

The problem of boundary-layer flow is formulated for a gaseous mixture, resulting from the dissociation of a single perfect diatomic gas. Flow quantities, such as surface temperature and skin-friction and heat-transfer coefficients are evaluated.

10136 On Transition From Laminar to Turbulent Flow. Francis R. Hama, James D. Long, and John C. Hegarty. *Journal of Applied Physics*, v. 28, Apr. 1957, p. 388-394.

Water-tank observations of the flow phenomena associated with boundary-layer transition have revealed that a two-dimensional discrete vortex line, considered to be the consequence of an amplified perturbation wave, has a strong tendency, in shear flows, to form three-dimensional vortex loops with a marked transverse wavelength.

10137 Dynamic Compression of Liquids From Measurements on Strong Waves. John M. Walsh and Melvin H. Rice. *Journal of Chemical Physics*, v. 26, Apr. 1957, p. 815-823.

10138* Rayleigh's Problem at Low Mach Number According to the Kinetic Theory of Gases. Hsun-Tiao Yang and Lester Lees. *Journal of Mathematics and Physics*, v. 35, Oct. 1956, p. 195-235.

Grad's thirteen-moment method is applied to the problem of an infinite flat plate set impulsively into uniform motion in its own plane in an "incompressible" viscous fluid. Plate velocity is small compared with the speed of sound in the gas before the start of the motion.

10139* A Fess Streamline Theory for Two-Dimensional Fully Cavitated Hydrofoils. T. Yao-Tsu Wu. *Journal of Mathematics and Physics*, v. 35, Oct. 1956, p. 236-265.

10140* (German.) Exchange of Impulse, Heat, and Materials. **Impuls-, Wärme- und Stoffaustausch.** P. Grassmann. *Maschinenbau und Wärmewirtschaft*, v. 12, Mar. 1957, p. 61-70.

Exchange of impulse, heat and material for a simplified model of an ideal gas; dependence of pressure and temperature on durability, heat conductivity and diffusion, exchange in the

laminar boundary layer; viscosity and diffusion in fluids; mathematical treatment of the laminar boundary layer and turbulent regions.

10141* Calculation of Axially Symmetric Cavities and Jets. P. R. Garabedian. *Pacific Journal of Mathematics*, v. 6, no. 4, 1956, p. 611-684.

Steady, axially symmetric, irrotational flows of an incompressible liquid were studied with reference to motions that exhibit a free surface along which the liquid is bounded by a gas whose inertia is negligible relative to that of the liquid, so that the gas can be assumed to be at rest and to have constant pressure.

10142 Stability of Laminar Flow in Curved Channels. Chia-Shun Yih and W. M. Sangster. *Philosophical Magazine*, v. 2, ser. 8, Mar. 1957, p. 305-310.

The occurrence of secondary flow is analyzed by Chandrasekhar's method under the assumption that the primary flow is two-dimensional and between two concentric circular cylinders of small spacing, and that it is already fully established.

10143 Structure of a Shock Front in Argon. John W. Bond, Jr. *Physical Review*, v. 105, ser. 2, Mar. 15, 1957, p. 1683- 1694.

For a given shock velocity the shock front is flat and nonluminous at first, but soon becomes luminous with corresponding change in hydrodynamic variables and degree of ionization; the flat portion decreases in width with increasing shock velocity.

10144* (English.) **The Forces Experienced by Two Circular Cylinders in a Uniform Flow at Small Reynolds Numbers.** Shinji Kuwabara. *Physical Society of Japan, Journal*, v. 12, Mar. 1957, p. 291-299.

10145 Hydromagnetic Instabilities of an Ideally Conducting Fluid. R. J. Tayler. *Physical Society, Proceedings*, v. 70, no. 445B, Jan. 1957, p. 31-48.

Considers a fluid confined by the pinch effect of an axial current.

10146 Intensity, Scale, and Spectra of Turbulence in Mixing Region of Free Subsonic Jet. James C. Laurence. *U. S. National Advisory Committee for Aeronautics, Report* 1292, 1956, 27 p. (TL521 Un3r Vis.)

10147 Measurements of the Nonlinear Variation With Temperature of Heat-Transfer Rate From Hot Wires in Transonic and Supersonic Flow. Warren Winovich and Howard A. Stine. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3965, Apr. 1957, 33 p. (TL570 Un3t)

Equilibrium temperatures and heat-transfer rates for 0.00015- and 0.00030-in. diameter W wires normal to the flow were determined throughout the Mach number range 0.5 to 2.5 with Reynolds number varying between the limits 18 and 144.

10148 Simplified Procedures for the Calculation of Heat Transfer to Surfaces With Non-Uniform Temperatures. J. P. Hartnett, E. R. G. Eckert, Roland Birkebak, and R. L. Sampson. *Wright Air Development Center, WADC Technical Report No.* 56-373, 1956, 79 p. (TL507 Un3.18w Vis.)

Several wall temperature distributions are given to illustrate the procedure. An alternative calculation method is also presented using approximate expressions which are developed.

See also: **10166** (computer for gas network flow problems); **10179** (spectra produced by shock waves); **10273** (hydraulic machinery research).

FOOD TECHNOLOGY

10149 Food. Harry W. von Loesecke. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 2, p. 647-656.

Review of analytical methods for moisture, proteins, amino acids, inorganic ions, fats and oils, enzymes, carbohydrates, vitamins, color, taste, insecticide residues, contamination, and spoilage.

10150 Food Poisoning. G. M. Dack. 3rd Rev. Ed. 251 p. 1956. University of Chicago Press, Chicago. (RC143 D11f3)

Revised edition presents increased emphasis on chemical food poisoning and examines issues that have arisen in food processing with reference to various types of bacterial poisoning. Also included is newly available data from the Far East regarding fish poisoning.

10151* Effect of Controlling Environmental Conditions During Aging on the Quality of Beef. R. B. Sleeth, R. L. Henrickson, and D. E. Brady. *Food Technology*, v. 11, Apr. 1957, p. 205-208.

10152* The Diacetyl Test as an Aid for Quality Control of Citrus Products. I. Detection of Bacterial Growth in Orange Juice During Concentration. E. C. Hill and F. W. Wenzel. *Food Technology*, v. 11, Apr. 1957, p. 240-243.

10153 The Freezing Preservation of Foods. v. I. Freezing of Fresh Foods. Donald K. Tressler and Clifford F. Evers. 3rd Rev. Ed. 1214 p. 1957. Avi Publishing Co., Westport, Conn. (TP493 T72f3)

Principles of refrigeration; equipment; preparation and freezing of various types of fresh foods; warehousing and marketing; nutritive values; cooking and serving frozen foods; transportation; quality control.

10154 Rapid Spectrophotometric Technique for Evaluation of Vanilla Extracts. Reuben Pomerantz, Samuel A. Goldblith, and Bernard E. Proctor. *Journal of Agricultural and Food Chemistry*, v. 5, Apr. 1957, p. 292-293.

10155 Metallic Components of Fruit Juices. I. Copper as a Factor Affecting Sedimentation in Bottled Apple Juices. Margaret E. Kieser, A. Pollard, and C. F. Timberlake. **II. The Nature of Some Copper Complexes in Apple Juice.** C. F. Timberlake. *Journal of the Science of Food and Agriculture*, v. 8, Mar. 1957, p. 151-168.

10156 Sterilization in Food Technology. Theory, Practice, and Calculations. C. Olin Ball and F. C. W. Olson. 654 p. 1957. McGraw-Hill, New York. (TP371 B21s)

Resistance of bacteria, molds, and yeasts to heat; mechanism of heat transfer in food and food containers; combination of these factors into a theory for prediction of the conditions under which sterilization can be accomplished.

See also: **10330** (packaging of fruit); **10840** (cannery waste disposal).

FUELS AND COMBUSTION

10157 Solid and Gaseous Fuels. Industrial Applications of Analysis, Control, and Instrumentation. W. H. Ode. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 2, p. 657-669.

Review of methods of sampling, analyzing, and testing solid and gaseous fuels.

10158* A New Smokeless Fuel. T. Nicklin. *British Chemical Engineering*, v. 2, Apr. 1957, p. 208-209.

Chemical engineering aspects of carbonizing coal at a low temperature with accompanied gas injection. Process yields and thermal efficiencies of high- and low-temperature processes.

10159 A Method for the Measurement of Heat Generation in Powdered Coal. P. C. Newman. *British Journal of Applied Physics*, v. 8, Apr. 1957, p. 162-167.

Method depends only on the thermal constants of the material and not on the heat losses to the surroundings of the calorimeter.

10160* Stability Limits of Flames of Ternary Hydrocarbon Mixtures. P. F. Kurz. *Combustion and Flame*, v. 1, Mar. 1957, p. 3-13.

Studies of lean blow-off and flash-back limits of laminar flames of ternary hydrocarbon mixtures containing ethylene show that these stability limits of the mixtures are predictable. At rich blow-off, there is evidence of inhibition in mixtures where ethylene is the primary fuel and in mixtures where the ethylene concentration exceeds a certain minimum as a secondary fuel.

10161* The Slow Oxidation of Methane—The Role of the Surface on the Course of the Oxidation of Methane. A. C. Egerton, G. J. Minkoff, and K. C. Salooja. *Combustion and Flame*, v. 1, Mar. 1957, p. 25-52.

Influence of surface condition of Pyrex and other vessels upon the rate and nature of oxidation as measured by pressure change, and by following the rate of formation of the intermediates HCHO and H_2O_2.

10162* Some Properties of Formaldehyde Flames. A. R. Hall, J. C. McCoubrey, and H. G. Wolfhard. *Combustion and Flame*, v. 1, Mar. 1957, p. 53-59.

10163* Flame Zone Studies. III. Techniques for the Determination of Composition Profiles of Flame Fronts. R. M. Fristrom, R. Prescott, and C. Grunfelder. *Combustion and Flame*, v. 1, Mar. 1957, p. 102-113.

10164 Chemical Structure and Properties of Coal. XVIII. Oxygen Groups in Coal and Related Products. L. Blom, L. Edelhausen, and D. W. van Krevelen. *Fuel*, v. 36, Apr. 1957, p. 135-153.

Methods for determining oxygen-containing functional groups are compared. A brown coal and a number of petrographically homogeneous vitrinites with varying carbon contents were examined for their hydroxyl, carbonyl, carboxyl, and methoxyl contents.

10165 Chemical Constitution of Coal. V. Optimum Conditions for the Hydrogen Peroxide Oxidation of Humic Acid to Sub-Humic Acids. G. J. Lawson. *Fuel*, v. 36, Apr. 1957, p. 182-190.

10166* Practical Aspects of Analysis With an Electronic Computer. G. G. Wilson, D. V. Kniebes, and R. T. Ellington. *Gas*, v. 33, May 1957, p. 73-79.

Use of a digital computer to solve gas network flow problems.

10167 Performance of Intermittently-Fired Oil Furnaces. W. G. Colborne. *Heating, Piping & Air Conditioning*, v. 29, Apr. 1957, p. 147-150.

Performance under intermittent firing is different from that under continuous firing. Factors causing the changes in performance are discussed.

10168 Oxidation of Peat to Organic Acids. Edgar L. Piret, R. F. Hein, E. D. Besser, and R. G. White. *Industrial and Engineering Chemistry*, v. 49, Apr. 1957, p. 737-741.

Alkaline permanganate converted 13 to 22% of the C to water-soluble polycarboxylic acids. The production of so-called regenerated humic acids resulted from treatment with HNO_3 or air. Air oxidation at 150 C gave up to 36% yields of these acids.

10169 Burning Velocities of Bunsen Burner Flames by the Flame-Pressure Method. Loren E. Bollinger, William A. Strauss, and Rudolph Edse. *Industrial and Engineering Chemistry*, v. 49, Apr. 1957, p. 768-773.

The theoretical relationship between flame pressure and burning velocity cannot be used to calculate burning velocities from flame pressures measured somewhere in the burner tube because of the radial escape of unburned gas through the dead space.

10170 Spontaneous Ignition of *n*-Heptane-Air Mixtures in a Steady-Flow Process. Willard E. Bair, Donald R. Olson, and Lester C. Lichty. *Industrial and Engineering Chemistry*, v. 49, Apr. 1957, p. 774-779.

Effects of energy liberation and heat transfer.

10171* Chemistry of Coal and Its Relation to Coal Carbonization. I. G. C. Dryden. *Institute of Fuel, Journal*, v. 30, Apr. 1957, p. 193-222.

10172 Metallic Recuperators: Their Application to Industrial Furnaces. W. Ernest and C. B. Tupholme. *Iron & Steel*, v. 30, Apr. 1957, p. 139-142.

Design and theoretical aspects; constructional materials. (To be concluded.)

10173 The Effect of Chemical Structure on the Hypergolic Ignition of Amine Fuels. Louis R. Rapp and Murray P. Strier. *Jet Propulsion*, v. 27, Apr. 1957, p. 401-404.

In order for a saturated aliphatic primary amine to be hypergolic, it must have at least one, but no more than two, C-H bonds at the α-C position. Substitution of a methyl group for a secondary H atom at the α-C position is conducive to hypergolicity.

10174 The Microbiology of Coal. I. Bacterial Oxidation of Phenanthrene. Martin H. Rogoff and Irving Wender. *Journal of Bacteriology*, v. 73, Feb. 1957, p. 264-268.

An organism identified as a member of the genus *Pseudomonas* has been isolated which oxidizes phenanthrene as a sole C source. Oxidation proceeds via 1-hydroxy-2-naphthoic acid which has been isolated and identified.

10175 Burning-Rate Studies. V. Effect of Acid Concentration on the Consumption Rate of Various Fuels With Nitric Acid. A. Greenville Whittaker and Harry Williams. *Journal of Physical Chemistry*, v. 61, Apr. 1957, p. 388-394.

Curves for the system 2-nitropropane—nitric acid were determined at acid concentrations from 90 to 100% and indicate rather clearly the development of the "low pressure step" at high acid concentration.

10176* (Japanese.) **A Method of Calculating the True Temperature of Combustion Gas by Using an Ordinary Thermocouple in a Protection Tube, With Special Reference to the Radiation Heat Transfer in the Case.** Susumu Yokobori. *Journal of Railway Engineering Research (Japan)*, v. 14, Mar. 15, 1957, p. 123-138.

The values needed are temperatures, emissivities, areas and relative positions of the walls which enclose the combustion chamber, and temperature and emissivity of the gas within the chamber.

10177* (French.) New Studies on the Coking of Coal Mixtures. **Nouvelles études sur la cokéfaction des mélanges de charbon.** A. F. Boyer, J. Lahouste, and R. Malzieu. *Revue de l'Industrie Minérale*, v. 39, Mar. 1957, p. 232-256.

Determining the general relationships between the mechanical quality of a coke and the properties of the coal used.

10178 (Italian.) Study of the Solvent Extraction of Bituminous Coal. **Studi sulla estrazione con solventi di carboni bituminosi. III.** Influence of Extraction Temperature on Composition of the Extracts. **Influenza della temperatura di estrazione sulla composizione degli estratti.** V. Berti, B. Casu, C. Manci, and C. Siniramed. *Rivista dei Combustibili*, v. 11, Feb. 1957, p. 91-104.

Extracts obtained using tetrahydrofurane, morpholine, and tetrahydronaphthalene at various temperatures were analyzed by the infra-red absorption method.

10179 Spectra Produced by Shock Waves, Flames and Detonations. A. R. Fairbairn and A. G. Gaydon. *Royal Society, Proceedings*, v. 239, ser. A, Apr. 9, 1957, p. 464-475 + 2 plates.

Emission spectra excited in various gases, including fuel and fuel + argon mixtures, by strong shock waves from a bursting diaphragm are compared with those given by flames and by spark- and shock-ignited detonations.

10180 Further Experiments on the Stability of Laminar and Turbulent Hydrogen-Air Flames at Reduced Pressures. Burton Fine. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3977, Apr. 1957, 31 p. (TL570 Un3t)

Stability limits were measured as a function of pressure, burner diameter, and composition.

See also: **10215** (jet combustion chamber flame holder); **10941** (pipeline transportation of coal).

GEOLOGY, GEOPHYSICS, MINERALOGY, AND MINING ENGINEERING

10181* Measurement of the Attenuation of Low-Frequency Under-Water Sound. M. J. Sheehy and R. Halley. *Acoustical Society of America, Journal*, v. 29, Apr. 1957, p. 464-469.

Attenuation in db. per kiloyard over the frequency range 20 c.p.s. to 60 kc. is equal to $0.033\ f^{3/2}$ (f in kc. per sec.).

10182* Severe Local Storms and Mid-Tropospheric Flow Patterns. E. J. Fawbush, Robert C. Miller, and Loyd G. Starrett. *American Meteorological Society, Bulletin,* v. 38, Mar. 1957, p. 115-123.

Association of severe local storms with frontal activity and the average 500 mb wind flow.

10183* Refractive Index Profiles and Associated Synoptic Patterns. William A. Arvola. *American Meteorological Society, Bulletin,* v. 38, Apr. 1957, p. 212-220.

A study of meteorological conditions associated with synoptic patterns passing over the Middle West leading to super-refractive index profiles.

10184 Five - Year Climatological Summary, July 1949 - June 1954, Argonne National Laboratory, Du Page County, Illinois. Harry Moses and Jack H. Willett. *Argonne National Laboratory (U. S. Atomic Energy Commission),* ANL-5592, July 1949-June 1954, 390 p. (UF767 Un3.1an Contin.)

Data on wind, temperature, relative humidity, precipitation, solar radiation, atmospheric pressure, soil temperature, and atmospheric stability.

10185 Asbestos, Its Origin, Production and Utilization. W. E. Sinclair. 365 p. 1955. Mining Publications, Ltd., London. (TN930 Si62a)

Varieties of asbestos; form, nature, and world distribution of deposits; mining and milling methods; classification, grading, marketing, and prices; commercial applications; synthetic asbestos and substitutes; economic considerations.

10186 A Bibliography on Meteorites. Harrison Brown, editor. 686 p. 1953. University of Chicago Press, Chicago. (Z6033.M5 B81b)

A chronologically arranged bibliography covering all of the world literature on meteorites and related subjects published between 1491 and 1950. Includes 25,000 references.

10187 The Gelation of Montmorillonite. I. The Formation of a Structural Framework in Sols of Wyoming Bentonite. Marjorie B. M'Ewen and Margaret I. Pratt. **II. The Nature of the Interparticle Forces in Sols of Wyoming Bentonite.** Marjorie B. M'Ewen and D. L. Mould. *Faraday Society, Transactions,* v. 53, Apr. 1957, p. 535-564 + 3 plates.

10188* Systematic Variation of Rare-Earth Elements in Cerium-Earth Minerals. K. J. Murata, H. J. Rose, Jr., M. K. Carron, and J. J. Glass. *Geochimica et Cosmochimica Acta,* v. 11, Mar. 1957, p. 141-161.

A quantity called Σ, which is the sum of the atomic percentages of La, Ce, and Pr, is proposed as an index of composition of all cerium-earth minerals with respect to the rare-earth elements. This quantity was found to range between 58 and 87 at.% of the total rare-earth elements in ten monazites from widely scattered localities.

10189 Geography and Geology of Maryland, Bulletin 19. Harold E. Vokes. 243 p. 1957. State of Maryland, Department of Geology, Mines and Water Resources, Baltimore. (QE121 M36b Vis.)

Physical features, natural resources, and economic geography of Maryland.

10190* Some Effects of Intense Solar Activity on Radio Propagation. R. E. Houston, Jr., W. J. Ross, and E. R. Schmerling. *Journal of Atmospheric and Terrestrial Physics,* v. 10, Mar. 1957, p. 136-139 + 1 plate.

10191* Rotation, Pulse-Disturbance, and Drift in the Geomagnetic Secular Variation. E. R. Hope. *Journal of Geophysical Research,* v. 62, Mar. 1957, p. 29-42.

10192* Calculations of Ionospheric Reflection Coefficients at Very Low Radio Frequencies. James R. Wait and Loris B. Perry. *Journal of Geophysical Research,* v. 62, Mar. 1957, p. 43-56.

A set of calculated curves are presented for the reflection coefficients at a sharply bounded homogeneous ionized medium with a superimposed magnetic field.

10193* Solar Radiation Availability on Surfaces in the United States as Affected by Season, Orientation, Latitude, Altitude and Cloudiness. Clarence F. Becker and James S. Boyd. *Journal of Solar Energy Science and Engineering,* v. 1, Jan. 1957, p. 13-21.

10194* Kingite. A New Hydrated Aluminium Phosphate Mineral From Robertstown, South Australia. K. Norrish, Lillian E. R. Rogers, and R. E. Shapter. *Mineralogical Magazine and Journal of the Mineralogical Society,* v. 31, Mar. 1957, p. 351-357.

Mineral has an idealized formula $Al_2O_3 \cdot Al(OH)_3 \cdot P_2O_5 \cdot 9H_2O$, with some replacement of OH by F. The specific gravity is 2·2 to 2·3, refractive index 1·514, and percentage chemical composition Al_2O_3, 31·92, P_2O_5 28·63, and H_2O 37·93. The three strongest lines on the X-ray diffraction pattern are 9·1, 3·45, and 3·48 A.

10195 Geological Investigations in Ohio, 1956. Carolyn Farnsworth. *Ohio Department of Natural Resources, Division of Geological Survey, Information Circular No.* 21, 1957, 33 p. (QE51 Oh3.3i Vis.)

From a successful polling of 106 listings in the Ohio Geological Survey, entries on 145 projects, usually annotated, are presented.

10196 Petroleum Production Technology. American Institute of Mining, Metallurgical, and Petroleum Engineers, Proceedings. 124 p. 1956. Texas Engineering Experiment Station, College Station, Texas. (TN863 Am35p)

Consists of 17 papers representing the most recent theory and practice known to petroleum technologists.

10197* (English.) **Lattice Energies and Other Properties of Crystals of Alkaline Earth Chalcogenides.** Maurice L. Huggins and Yosio Sakamoto. *Physical Society of Japan, Journal,* v. 12, Mar. 1957, p. 241-251.

10198* The Potentials About a Point Electrode and Apparent Resistivity Curves for a Two-, Three-, and Four-Layered Earth. Harold M. Mooney and W. W. Wetzel. 146 p. 1956. University of Minnesota Press, Minneapolis. (QE501 M77p Ref.)

Principles by which surface electrical measurements respond to variations in geologic structure of the earth at various depths. Applications in geophysical prospecting and other physical problems.

10199 Shifting of the Earth's Axis of Rotation. David R. Inglis. *Reviews of Modern Physics,* v. 29, Jan. 1957, p. 9-19.

An equilibrium-deformation model portrays the effect of the elastic deformation which takes place in the free nutation and is held responsible for the slowing down of the 306-day Euler nutation of a rigid earth to the observed Chandler period of about 420 days. It is modified to facilitate explanation of Gold's polar wandering theory depending on static asymmetric deviations from a perfect figure of the earth, such as excess mountains in two opposite octants.

10200 Preliminary Measurements of Atmospheric Turbulence at High Altitude as Determined From Acceleration Measurements on Lockheed U-2 Airplane. Thomas L. Coleman and Jack Funk. *U. S. National Advisory Committee for Aeronautics, Research Memorandum,* L57A11, Mar. 1957, 14 p. (TL782 Un3rm Vis.)

Substantial reductions are indicated in the number and intensity of gusts at altitudes up to 55,000 ft.

10201 The Water Resources of Caroline, Dorchester, and Talbot Counties. Bulletin 18. 465 p. 1957. State of Maryland, Department of Mines and Water Resources, Baltimore. (QE121 M3bb Vis.)

Ground - water resources; surface - water resources; salinity studies in estuaries of the Eastern Shore.

See also: **9615** (analysis of rocks and ores); **10081** (ionosphere reflection of waves).

GRAPHIC ARTS

10202* NPIRI Standard Test Methods for Pigment Identification. Carolyn E. Moore. *American Ink Maker,* v. 35, May 1957, p. 50 + 3 pages.

Qualitative chemical tests for chromate pigments, benzidine and Hansa yellow, phloxine and rhodamine toners, alkali blue and tungstated or molybdated toners, iron blue, phthalocyanine and ultramarine blues, sulfide pigments, cadmium red, and TiO_2.

10203 Glossary. 22 p. 1956. National Association of Blueprint and Diazotype Coaters, Washington, D. C. (TR900 N21g)

An explanation of the terms, processes, and methods employed in the coating of blueprint and diazotype ultraviolet-light sensitive materials.

10204* 3-Color Direct Separation. III. Masking for Color Separations. John M. Lupo, Jr. *Modern Lithography*, v. 25, May 1957, p. 44 + 6 pages.

10205 (German.) Modern Photomechanical Methods in Theory and Practice. **Moderne Chemigraphie in Theorie und Praxis.** A. F. Gygax. 580 p. 1956. Polygraph Verlag, GMBH, Frankfurt. (TR925 G99m Over.)

General information on the photomechanical methods and their historical and scientific background; principles underlying modern photography in printing, as well as practical and technical processes in use. The book is very thorough giving abundant theoretical and technical data useful to the graphic arts specialist.

10206 Photographic Granularity and Graininess. IX. Techniques and Equipment for the Objective Measurement of Graininess. L. A. Jones, G. C. Higgins, K. F. Stultz, and H. F. Hoesterey. *Optical Society of America, Journal*, v. 47, Apr. 1957, p. 312-321.

Photoelectric scanning instrument gives granularity values in terms that can be converted into the graininess values that would be obtained by an observer viewing a magnified image of the sample under standard conditions.

10207 Development of Aerial Camera Stabilization and Its Effect on Photogrammetry and Photo Interpretation. Timothy Trott. *Photogrammetric Engineering*, v. 23, Mar. 1957, p. 122-130.

Modern gyroscope and servo techniques have achieved a high degree of stabilization.

10208 A Preliminary Study of the Influence of Photo Paper Characteristics Upon Stereo Image Perception. Merle P. Meyer. *Photogrammetric Engineering*, v. 23, Mar. 1957, p. 149-155.

Glossy-surfaced papers were superior to dull, but the difference was relatively small.

10209 Construction and Performance of a High-Speed Cinemicrograph. J. S. Courtney-Pratt and Charles M. Huggins. *Review of Scientific Instruments*, v. 28, Apr. 1957, p. 256-262.

Camera produces a series of 200 pictures at 100,000 frames per sec.

10210* (French.) A Contribution to the Study of the Passage From the Optical Image to the Photographic Image. **Contribution a l'étude du passage de l'image optique a l'image photographique.** Madeleine Marquet. *Revue d'Optique*, v. 36, Feb. 1957, p. 53-70.

Distortion due to the photographic receiver may be foreseen for linear images with more than about three times the resolving power of the tested emulsion, by the determination of a fictive illumination distribution called "effective image". In ordinary development the effective image corresponds to the illumination distribution after diffusion of light in the whole thickness of the sensitive layer.

10211* Spray Processing in a Commercial Laboratory. Ralph D. Whitmore, Jr. *Society of Motion Picture and Television Engineers, Journal*, v. 66, Apr. 1957, pt. 1, p. 194-197.

Spray processor using impingement drying is used for developing 16 mm. and 35 mm. black-and-white negatives and positives of all types at 80 F.

10212* A New Color Intermediate Positive—Intermediate Negative Film System for Color Motion-Picture Photography. H. J. Bello, Jr., N. H. Groet, W. T. Hanson, Jr., C. E. Osborne, and D. M. Zwick. *Society of Motion Picture and Television Engineers, Journal*, v. 66, Apr. 1957, pt. 1, p. 205-209.

Characteristics and usage of new film.

HEAT POWER

10213* Diesel Engine Coupling, Incorporating Flexibility and Forced Vibration Damping. G. Hallewell. *Gas and Oil Power*, v. 52, Mar. 1957, p. 75-78.

10214 Liquid Rocket Propellants; Fuels and Oxidizers of the Future. R. A. Carpenter. *Industrial and Engineering Chemistry*, v. 49, Apr. 1957, p. 42A-48A.

Characteristics and properties; limitations of present fuels; hypothetical propellant possibilities.

10215 Preliminary Evaluation of a Rotating Flame Stabilizer. John H. Grover, Michael G. Kesler, and Arch C. Scurlock. *Jet Propulsion*, v. 27, Apr. 1957, p. 386-391.

The feasibility of rotating a bluff flameholder as a means of increasing volumetric heat-release rates in high-output combustion chambers was investigated.

10216* (German.) The Economy of Coal-Fired Gas Turbines With Open Cyclic Process. **Die Wirtschaftlichkeit der kohlegerfeuerten Gasturbinen mit offenem Kreisprozess.** Nebojsa Gasparovic. *Maschinenbau und Wärmewirtschaft*, v. 12, Feb. 1957, p. 50-54.

Preparation of coal; combustion; dust removal; effect of ash on turbine blades; pressure losses; efficiency of heat exchange.

10217* GM's Fuel-Injection System. Here's How It Works. John Dolza, E. A. Kehoe, Donald Stoltman, and Zora Arkus-Duntov. *SAE Journal*, v. 65, Apr. 1957, p. 20-25.

System uses continuous-flow injection into the intake ports, with open orifice nozzles directing the fuel toward the intake valves. Control is based on mass flow metering, in which venturi throat depression is related mechanically to fuel pressure.

10218 (Czech.) Air-Cooled Internal Combustion Engines. **Chlazení spalovacích motorů vzduchem.** Z. Moravec. *Strojírenství*, v. 6, Dec. 1956, p. 807-812.

Factors necessitating cooling of combustion engines. The amount of heat to be removed and its effect upon the input of the cooling system. Various methods of ribbing and the requirements of cooling efficiency.

10219 Survey of the Acoustic Near Field of Three Nozzles at a Pressure Ratio of 30. Harold R. Mull and John C. Erickson, Jr. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3978, Apr. 1957, 32 p. (TL570 Un3t)

Measurements of total noise; determination of acoustic spectra at various stations.

10220 Investigation of Semivaneless Turbine Stator Designed to Produce Axially Symmetrical Free-Vortex Flow. Harold E. Rohlik and William T. Wintucky. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3980, Apr. 1957, 39 p. (TL570 Un3t)

Performance was evaluated with static pressures measured in the vaneless section and surveys of total pressure and flow angle made at the stator exit.

10221 Investigation of Burnout Heat Flux in Rectangular Channels at 2000 PSIA. H. S. Jacket, J. D. Roarty, and J. E. Zerbe. *Westinghouse Electric Corporation, Atomic Power Division (U. S. Atomic Energy Commission)*, WAPD-A1W (IM)-3, Dec. 1955, 52 p. (UF767 Un3.1wa Contin.)

Studies of failures in heat-transfer surfaces.

10222 Injection and Combustion of Liquid Fuels. A. A. Putnam, et al. *Wright Air Development Center, Aeronautical Research Laboratory, WADC Technical Report* 56-344, Mar. 1957, 740 p. (TL507 Un3.18w Vis.)

A monograph consisting of 19 sections covering the categories of atomization of liquid fuels, ballistics of droplets, evaporation of droplets, fluid dynamics, homogeneous combustion, and heterogeneous combustion.

See also: **9421** (effect of ground proximity on jet thrust); **9552** (heat transfer media); **10146** (turbulence in high-speed jets); **10173** (ignition of amine fuels); **10251** (alcohol as diesel engine fuel); **10838** (engine exhaust purifier).

INFORMATION—PREPARATION AND DISSEMINATION

10223 Reading Rates and the Information Rate of a Human Channel. J. R. Pierce and J. E. Karlin. *Bell System Technical Journal*, v. 36, Mar. 1957, p. 497-516.

People read words as fast as they were able to; from these results deductions were made about the capacity of a human being as a channel.

10224 Chemical Engineering Reports. How to Search the Literature and Prepare a Report. Kenneth A. Kobe. 4th Ed. 175 p. 1957. Interscience Publishers, New York. (P7 K74c4)

Emphasizes preparation of an effective report through good writing, attractive styling of the report and its illustrations, and complete citation of the literature from which the information has been secured.

10225* What Is the Basic Language Skill? Evidence From Aphasia Studies on the Importance of Auditory Language. Don Brown. *ETC; Review of General Semantics*, v. 14, Winter 1956-57, p. 103-118.

"Auding" is the fundamental linguistic experience upon which the normal development of the other language skills depends. It involves hearing, listening to, recognizing (or perceiving), and interpreting spoken symbols.

10226* International Communication and Political Opinion. A Guide to the Literature. Bruce Lannes Smith and Chitra M. Smith. 325 p. 1956. Princeton University Press, Princeton. (ZHM261 B89i Ref.)

Annotated bibliography of the literature from 1943 to 1955 includes 2563 references to writings relevant to international communication and censorship, political propaganda activities, specialists in political persuasion, channels of international communication, audience characteristics, and research and intelligence methods.

10227* (English, French, and German.) **Manual on Document Reproduction and Selection. Chap. VII. Selection.** Sections individually paged. 1957. International Federation for Documentation, Hague, Netherlands. (Z265 F31m Ref.)

Classification and adaptation of documents for mechanical selection. Punched card systems. Photoelectric and electronic methods in documentation.

10228 Needed Research for Machine Information Systems. John W. Kuipers. *North Atlantic Treaty Organization, Advisory Group for Aeronautical Research and Development Report* 47, Feb. 1956, 18 p. (TL565 Ag11r Contin.)

Explains the difficulties which have arisen in using machines for documentation purposes and analyzes their causes; need for research on the nature of units to be handled in machine systems.

10229 Operational Problems Requiring Documentation Research. Verner W. Clapp. *North Atlantic Treaty Organization, Advisory Group for Aeronautical Research and Development, Report* 48, Feb. 1956, 7 p. (TL565 Ag11r Contin.)

General discussion of factors involved in documentation. The form of the document affects the manner of its treatment and storage, and these in turn affect the retrieval of the information contained in it and the creation of new documents.

10230 Notes on Cataloguing Books in Certain Foreign Languages. Mary Piggott, editor. 53 p. 1956. Library Assn., London. (Z695 P62n)

Some peculiarities of the French, Italian, Spanish, German, Dutch, Afrikaans, Swedish, Danish, and Norwegian languages. Glossary of words likely to be met on title-pages and preliminaries.

10231 Authorship & Company Policy. Scott Nicholson. *Research & Engineering*, v. 3, Apr. 1957, p. 28 + 4 pages.

What companies are doing to encourage scientists and engineers to publish the results of their work.

10232 Classifying and Indexing for the Special Library. Saul Herner and Robert S. Meyer. *Science*, v. 125, Apr. 26, 1957, p. 799-803.

Design of tailor-made classification systems for special libraries.

10233* Noun Phrase Analysis Using the IBM 650 Computer. Aristotelis D. Stathacopoulos. *Trend in Engineering (University of Washington)*, v. 9, Apr. 1957, p. 20-22.

Application of a computer in improving the accuracy, understandability, and readability of word-for-word machine translations.

INSTRUMENTATION

10234* (French.) Electron Diffraction. **La diffraction des electrons.** Jean Jacques Trillat. *Age Nucléaire*, no. 3, Mar.-Apr. 1957, p. 28-33.

Theoretical bases of electron diffraction. Methods used. Examples of applications in the study of surface phenomena and the internal structure of free molecules.

10235 Carbon Replication of Particulates and Ultramicroscopic Crystals. John H. L. Watson. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 1, p. 562-566.

10236 Inert-Atmosphere Dry Box. Thomas R. P. Gibb, Jr. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 1, p. 584-587.

Large, relatively inexpensive, and versatile apparatus may be employed for a wide variety of analytical manipulations, such as weighing, grinding, and transferring, in an atmosphere of inert gas, particularly N.

10237* Design of Test Equipment for High Temperature Operation. L. H. Smith. *Applied Hydraulics*, v. 10, Apr. 1957, p. 118 + 3 pages.

Test table quickly and accurately controls oil for tests from room temperature to 700 F and keeps the balance of system fluid at lower temperatures. This gives longer oil life and permits use of standard components and controls.

10238* Electron Optics as a Tool in Research. J. W. Menter. *British Communications & Electronics*, v. 4, May 1957, p. 280-286.

Instruments and techniques; types of information, particularly in the physical and metallurgical fields, which may be obtained with them.

10239 Some Carbon Replica Techniques for the Electron Microscopy of Small Specimens and Fibers. D. E. Bradley. *British Journal of Applied Physics*, v. 8, Apr. 1957, p. 151-154.

10240 Mercury-in-Quartz Thermometers for Very High Accuracy. H. Moreau, J. A. Hall, and Vera M. Leaver. *Journal of Scientific Instruments*, v. 34, Apr. 1957, p. 147-154.

10241* Notes on Performance Design of Parabolic Solar Furnaces. Raymond W. Bliss. *Journal of Solar Energy Science and Engineering*, v. 1, Jan. 1957, p. 22-29.

10242 Medium Vacuum as a Process Tool. Ormonde Bogert. *Product Engineering*, v. 28, Apr. 1957, p. 140-145.

Atmospheric pressure can be a useful tool in the handling of materials and parts during manufacture or assembly. Vacuum cups can lift surprisingly large loads, simple suction circuits move fluids awkward to handle in other ways, and atmospheric pressure applied to uneven surfaces simplifies molding and casting.

10243 Alternating-Gradient Magnetic Spectrometer. Hugh J. Martin and Alfred A. Kraus. *Review of Scientific Instruments*, v. 28, Mar. 1957, p. 175-177.

Spectrometer consists of two magnetic lenses that deflect the analyzed particles through a total angle of 30°. It is able to analyze protons with energies up to 6 m.e.v.

10244 New Low-Holdup High-Efficiency Laboratory Distillation Column. James D. Ray. *Review of Scientific Instruments*, v. 28, Mar. 1957, p. 200-201.

New column has the indentations perpendicular to the wall of the tube.

10245 Argonne 7.7-Meter Bent-Crystal Gamma-Ray Spectrometer. David Rose, Herbert Ostrander, and Bernard Hamermesh. *Review of Scientific Instruments*, v. 28, Apr. 1957, p. 233-244.

Design, construction, and operation of transmission type spectrometer having a focal length of 7.7 m.

10246 Metal System for Chemical Reactions and for Studying Properties of Gases and Liquids. H. V. Neher and Satya Prakash. *Review of Scientific Instruments*, v. 28, Apr. 1957, p. 267-270.

Advantages of Cu system are: a complete absence of contaminants; reactions may be carried out up to 500 C; pressures up to several hundred psi. may be used; flow of gases from very low to very high pressures may be easily controlled; the system is very rugged.

10247 Cryostats and Mechanical Stage for Nuclear Magnetic Resonance Studies. L. N. Mulay. *Review of Scientific Instruments*, v. 28, Apr. 1957, p. 279-282.

Cryostats for use with liquid He and other coolants providing temperatures in the range 77 to 600 K constant to within ± 1 degree are described.

10248 (French.) Solar Furnaces. The Heliodyne of the Algiers Observatory. **Fours solaires. L'héliodyne de l'observatoire d'Alger.** Jean Guillemin. *Review de l'Aluminium*, v. 34, Feb. 1956, p. 171-185.

Furnace designed for experiments on synthesis at very high temperatures, is 39-ft. high; the Al parabolic mirror has a diameter of 27-ft. 7-in.

10249* (Swedish.) A Microscope for Melting Point Determination and Thermal Analysis. **Mikroskopisk smältpunktsbestämning och termoanalys.** Magnus Matell. *Svensk Kemisk Tidskrift*, v. 69, no. 2, 1957, p. 90-102.

A hot-stage microscope for determination of melting points is described. Applications to thermal analysis determination of mol. wt., and other studies.

See also: **9899** (carbon replicas for electron microscopy); **9916** (coating thickness measurement); **10133** (pipeline control valves); **10532** (potentiostat as metallographic tool).

LUBRICATION AND FRICTION

10250* (German.) Dry Friction of Some Aluminum Alloys and Steels. **Über trockene Reibung bei einigen Aluminiumlegierungen und Stählen.** F. Bollenrath and H. Grefkes. *Aluminium*, v. 33, Apr. 1957, p. 234-240.

Coefficients of static and cold welding friction depend on materials and conditions, while those of pure sliding friction are determined by the properties of the material in the surface layers.

10251* Wear in High Speed Diesel Engines Operating on Power Alcohol as Principal Fuel. M. R. K. Rao and Y. M. Balakrishna. *Indian Institute of Science, Journal*, v. 39, sec. B, Jan. 1957, p. 17-22 + 3 plates.

Prolonged operation of a diesel engine with neat alcohol as the principal fuel has no adverse effect on the rate of wear. There is a noticeable reduction of engine deposits.

10252 Absolute Areas of Some Metallic Surfaces. Thomas L. O'Connor and Herbert H. Uhlig. *Journal of Physical Chemistry*, v. 61, Apr. 1957, p. 402-405.

Roughness factors were calculated for abraded iron foil and 18-8 stainless steel under various circumstances with ethane as adsorbate at −183 C.

10253* (Russian.) Oxidation of Lubricating Oils at Low and Average Temperatures. **Okislenie smazochnykh masel pri nizkikh i umerennykh temperaturakh.** G. I. Fuks and N. E. Gal'tsova. *Khimiia i Tekhnologiia Topliva*, no. 3, Mar. 1957, p. 28-37.

Measuring the absorption of O, the change of viscosity, and the chemical properties of thin layers of oil. The three stages of oxidation at low temperatures. Paraoxydiphenyls as antioxidants.

10254* (Russian.) A Progressive Determination of Lubricating Oil Composition by a Thin-Layer Evaporation Method. **Otsenka frakysionnogo sostava smazochnykh masel po metody tonkosloinogo isparenиia.** K. K. Papok, B. S. Zuseva, and V. P. Danilin. *Khimiia i Tekhnologiia Topliva*, no. 3, Mar. 1957, p. 48-57.

A method was developed based on the continuous evaporation in a pressurized atmosphere of small quantities of oil from a thin layer at a constant rate of heating.

10255 Materials for Small, Oil-Free Bearings. Hobart S. White. *Materials & Methods*, v. 45, Apr. 1957, p. 135-139.

Wear rates and friction coefficients of many combinations of metallic and nonmetallic materials.

10256* (German.) Investigation of the Lubricating Film Thickness and Determination of the Critical Locations in Main Bearings of a Combustion Motor. **Ermittlung der Schmierfilmdicke und Bestimmung der gefährlichen Stellen in den Grundlagern eines Verbrennungsmotors.** A. Mansur Sahin. *MTZ; Motortechnische Zeitschrift*, v. 18, Feb. 1957, p. 39-43.

10257 The Influence of Temperature on Metallic Wear. J. K. Lancaster. *Physical Society, Proceedings*, v. 70, no. 445B, Jan. 1957, p. 112-118.

Wear rate of 60/40 brass on tool steel was investigated over the range 20 to 600 C. At low temperatures, extensive intermetallic contact and welding occur, and the wear rate increases with increasing temperature. At high temperatures the wear rate decreases by several orders of magnitude and protective surface films are generated during sliding.

10258 The Variation of Friction With Velocity. R. T. Spurr and T. P. Newcomb. *Physical Society, Proceedings*, v. 70, no. 446B, Feb. 1957, p. 198-200.

The friction of a bituminous material decreases with increasing sliding velocity; this decrease is due to the creep behavior of the material.

10259 How to Service Ball and Roller Bearings. I. Effects of Design. E. P. Stahl. *Power Engineering*, v. 61, Apr. 1957, p. 80-83.

Most anti-friction bearing trouble can be traced to a few easily preventable causes.

10260 Friction and Lubrication. N. Pilpel. *Research*, v. 10, Apr. 1957, p. 138-144.

Review of recent advances in knowledge of theory and surface properties.

10261 Rotary Shaft Seals. E. T. Jagger. *Scientific Lubrication*, v. 9, Apr. 1957, p. 24-27.

Mechanism of sealing is that the surface tension of the oil forms a meniscus which prevents oil flow through the gap between the seal and the shaft.

10262* Effect of Vibration Frequency and Amplitude on Ball-Joint Grease Steering Performance. M. C. Goodwin and N. A. Hunstad. *Spokesman*, v. 21, Apr. 1957, p. 10-16.

Design of a bench test apparatus for evaluation of chassis grease performance. An automotive suspension ball joint is utilized in studying the effect of vibration upon the performance of chassis grease as measured by the torque required to rotate the stud of the ball joint.

10263 Bearings for Tough Jobs. *Steel*, v. 140, Apr. 8, 1957, p. 114 + 3 pages.

Data on bearing materials for difficult environments, high temperatures, and nuclear reactors.

See also: **10470** (fatigue properties of bearing alloys); **10501** (effect of hardness on wear properties); **10506** (wear of carbide tools); **10509** (wear of drop-forging dies).

MECHANICAL ENGINEERING

10264* Fire-Resistant Hydraulic Fluids. I. Emulsion Types. A. S. Morrow, H. E. Sipple, and R. T. Holmes. *Applied Hydraulics*, v. 10, Apr. 1957, p. 78 + 3 pages.

Operational characteristics, properties, and application.

10265* Resistance-Welded Hydraulic Tubing. *Applied Hydraulics*, v. 10, May 1957, p. 98 + 2 pages.

Advantages are cost, uniformity, and relative freedom from small surface defects or stress raisers which may cause failure under the vibration, pulsation, and surges present in hydraulic applications. Production process and specifications are summarized.

10266* Designing a Seal for Very High Pressure. Jan M. Garvin. *Applied Hydraulics*, v. 10, May 1957, p. 141 + 3 pages.

The step-by-step design of seals for 45,000 psi.

10267 Transverse Vibrations of Power Transmission Chains. S. Mahalingam. *British Journal of Applied Physics*, v. 8, Apr. 1957, p. 145-148.

The natural frequencies of a traveling chain are determined by treating the chain as a uniform string.

10268 Design for Environment: Floor-Ceilings and Service Systems in Multi-Story Buildings. 141 p. 1956. Building Research Institute, Washington, D. C. (TH5 N21.1d Over.)

Papers consider use of space; lighting, electrical, and air-conditioning systems; structural design; integration of design and practice.

10269* Engineering and Technical Handbook. Donald C. McNeese and Albert L. Hoag. 376 p. 1957. Prentice-Hall, Englewood Cliffs, N. J. (TA151 M23e)

Basic fundamentals and formulas; properties of materials; design information; conversion factors; basic principles of mathematics; mathematical tables.

10270* (German.) An Exact Solution for the Stress Distribution in Notches With Arbitrary Values of Depth and Notch Angle. **Eine strenge Lösung für die Spannungsverteilung in Kerben bei beliebiger Tiefe und beliebigem Flankenwinkel.** H. Neuber. *Forschung auf dem Gebiete des Ingenieurwesens*, v. 23, Ausgabe B, nos. 1-2, 1957, p. 9-10.

10271* (German.) Contributions to the Evaluation of Photoelastic Experiments on Discs and Plates in Transverse Bending. **Beiträge zur Auswertung spannungsoptischer Versuche an Scheiben und Platten.** A. Kuske. *Forschung auf dem Gebiete des Ingenieurwesens*, v. 23, Ausgabe B, nos. 1-2, 1957, p. 16-21.

Certain relations between the directions of the isochromatics, isoclinics, and other stress state quantities in isotropic as well as in usual parts of discs can be used to establish an equation or a nomogram for the determination of the direction of lines of constant stress.

10272* Conduction and Induction Pumps for Liquid Metals. L. R. Blake. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. A, Feb. 1957, p. 49-67.

Comparison of performance and design features.

10273* Techniques for Hydraulic Machinery Research. S. P. Hutton. *Institution of Engineers & Shipbuilders in Scotland, Transactions*, v. 100, pt. 4, 1956-57, p. 351-396.

Problems involved in achieving efficiency in measurements with an accuracy of 1 part in 1000, with special attention to the control and measurement of speed, torque, head, and flow. Models and their uses. Oil-pressure mechanisms.

10274* Fatigue Under Triaxial Stress: Development of a Testing Machine and Preliminary Results. J. L. M. Morrison, B. Crossland, and J. S. C. Parry. *Institution of Mechanical Engineers, Proceedings*, v. 170, no. 21, 1956, p. 697-712 + 2 plates.

Design and development of a machine capable of repeatedly applying to cylinders internal pressures of the order 20 tons per sq. in. Typical test results.

10275 The Plastic Bending of an Eccentrically Loaded Column. William E. Boyce. *Journal of the Aeronautical Sciences*, v. 24, May 1957, p. 332 + 7 pages.

Treats the behavior of a rigid, work-hardening column compressed by eccentric axial loads. A piecewise linear theory of plasticity is used to analyze the lateral displacements which occur as the loads are slowly increased.

10276 Buckling of Thin-Walled Circular Cylinders Under Axial Compression and Internal Pressure. Y. C. Fung and E. E. Sechler. *Journal of the Aeronautical Sciences*, v. 24, May 1957, p. 351-356.

10277 Designing Compound Epicyclic Gear Trains, for Maximum Efficiency at High Velocity Ratios. W. A. Tuplin. *Machine Design*, v. 29, Apr. 4, 1957, p. 100-104.

10278 Design Equations and Charts for Pressurized Cylinders and Spheres. B. Saelman. *Machine Design*, v. 29, Apr. 4, 1957, p. 121-126.

Data sheet for thick and thin-wall vessels under internal and external pressure loads .

10279 Analysis and Design of Permanent Magnet Assemblies. Charles A. Maynard. *Machine Design*, v. 29, Apr. 18, 1957, p. 122-143.

A step-by-step guide showing how to design a magnet assembly to produce the required magnetizing force and flux density.

10280 Synchronizing Motions With Hydraulic Cylinders. H. L. Stewart and J. M. Moritz. *Machine Design*, v. 29, May 2, 1957, p. 94-97.

A summary of ten methods for synchronizing cylinder motions.

10281 A Simplified Approach to Design and Specification of Small Extension Springs. P. F. Recca and Fred W. Smith. *Machine Design*, v. 29, May 2, 1957, p. 102-108.

Deals with springs for operation under fatigue load conditions where space is at a premium.

10282 Noise Reduction in Pumps and Pump Systems. Norman L. Meyerson. *Noise Control*, v. 3, Mar. 1957, p. 27 + 6 pages.

10283* Oscillation Criteria for Linear Differential Systems With Complex Coefficients. William T. Reid. *Pacific Journal of Mathematics*, v. 6, no. 4, 1956, p. 733-751.

10284 Centrifugal Pump Packings and Seals. III. Mechanical Seals. Harold Woodhouse. *Petroleum Refiner*, v. 36, Apr. 1957, p. 207-211.

Design, use, and care of mechanical seals; seals for high pressure.

10285* Belts and Chains. Althea Thornton. *Power*, v. 101, May 1957, p. 75-94.

Current trends, materials used, design features, selection, application, and maintenance.

10286* (Russian.) State of Stability in Compressed Elastic Plastic Rods. **O ravnovesii szhatykh uprugo-plasticheskikh sterzhnei.** Iu. R. Lepik. *Prikladnaia Matematika i Mekhanika*, v. 21, no. 1, 1957, p. 101-108.

During the process of longitudinal flexure, the compressing force acting on the ends of the rod can change. In some cases the solution given by Pflüger can lead to important errors. A more precise method for determining the flexure of the rod is given.

10287 New Approach Cuts Work in Epicyclic Gear Train Calculations. R. M. Conklin and James Ballmer. *Product Engineering*, v. 28, Apr. 1957, p. 186-187.

Step-by-step computations for epicyclic gear trains give forces and speeds without using hard-to-remember formulas, for compound as well as simple trains.

10288 Pump Selection and Application. Tyler G. Hicks. 422 p. 1957. McGraw-Hill, New York. (TJ900 H52p)

Step-by-step procedures for analyzing a pumping problem, finding the most suitable commercial pump for the job, and applying this pump to the conditions encountered.

10289 A New Approach to the Analysis of Truss Frames by the Rigid Joint Method. John M. Hayes. *Purdue University Engineering Bulletin, Engineering Experiment Station Research Series No.* 134, 38 p. (TA21 P97.2r Vis.)

Analysis of the truss frame, which considers the frame as a whole. Greater bending moments are found to exist in the columns of a trussed frame than those determined from the usual approximate analyses.

10290* (German.) Determination of Internal Stresses in Structural Components. **Bestimmung von Eigenspannungen in Bauteilen.** K. Wellinger and Fr. Eichhorn. *Schweissen und Schneiden*, v. 9, Mar. 1957, p. 93-97.

10291 Symposium on Speed of Testing of Non-Metallic Materials. 86 p. 1956. American Society for Testing Materials, Philadelphia. (TA410 Am35ss)

Papers deal with mechanical tests for wood, glass, plastics, yarns, rubber, concrete, and paper.

10292* (Polish.) Dimensioning of Stressed-Skin Construction. **Dobór wymiarów konstrukcji skorupowej.** Jerzy Lamparski. *Technika Lotnicza*, v. 12, Jan.-Feb. 1957, p. 2-9.

Critical stresses of plates, pipes, cylindrical coverings, and other structures particularly applicable to aircraft construction.

10293 Tool Design. Cyril Donaldson and George H. LeCain. 2nd Ed. 557 p. 1957. McGraw-Hill, New York. (TJ1185 D71t2)

General methods of tool design which enable the student to develop ideas into practical specifications for modern manufacturing methods. Includes topics such as springs, welding, and tolerances insofar as they are pertinent.

10294 Bursting Strength of Unstiffened Pressure Cylinders With Slits. Roger W. Peters and Paul Kuhn. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3993, Apr. 1957, 21 p. (TL570 Un3t)

Internal-pressure tests on Al alloy unstiffened cylinders with precut slits indicate that the pressurizing medium has a negligible effect on the bursting pressure.

10295* Simplified Design of Small Extension Springs. P. F. Recca and Fred W. Smith. *Western Union Technical Review*, v. 11, Apr. 1957, p. 60-71.

Procedures for designing small springs for use in telegraph apparatus.

See also: **9930** (hydraulic servomechanisms); **10077** (applications of electronics); **10329** (testing packaging materials); **10396** (design of light metal castings); **10895** (prediction of strength of joints).

METALLURGY

10296* Molybdenum. II. Oxidation Resistance, Properties and Application. D. O. Pickman. *Alloy Metals Review*, v. 8, Mar. 1957, p. 2-8.

10297 Uranium Alloys for High-Temperature Application. Henry A. Saller, Ronald F. Dickerson, and William E. Murr. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-1098, June 1956, 45 p. (UF767 U3b Contin.)

Results of a heat-treatment study, hot-hardness and dilation data, and the effects of β and γ thermal cycling upon cylinders of U-3.5, 5, 7, 9, and 12 wt.% Mo and U-3, 5, 7, 10, 15, and 20 wt.% Zr alloys.

10298* (German.) Contemporary Economical and Technical Situation of Titanium. **Die heutige wirtschaftliche und technische Lage auf dem Gebiete des Titans.** Richard Kieffer and Friedrich Benesovsky. *Berg-und Hüttenmännische Monatshefte*, v. 101, no. 12, 1956, p. 292-300.

A review of the Ti industry, including production methods and treatment, cost analysis, and possibilities of decreasing prices.

10299* Metallurgy of Steels for Deep-Drawing. A. J. K. Honeyman. *Birmingham Metallurgical Society, Journal*, v. 37, Mar. 1957, p. 465-496.

Chemical composition; grain-size and structure; properties of hot-rolled and cold reduced deep-drawing sheets; basic theories of yielding and aging; assessment of deep-drawing properties.

10300 Review of Iron and Steel Literature for 1956. V. S. Polansky. *Blast Furnace and Steel Plant*, v. 45, Apr. 1957, p. 400 + 8 pages.

List is concerned only with separately published books and pamphlets. (To be continued.)

10301 Ductile Chromium and Its Alloys. 376 p. 1957. American Society for Metals, Cleveland. (TN799.C5 Am35c)

A symposium of papers reviewing research in America, Europe, and Australia. Includes production of Cr metal, physical metallurgy of ductile Cr and high-Cr alloys, and effect of gas on properties.

10302 A Forgeable Chromium-Iron Alloy. D. P. Moon, H. A. Blank, and A. M. Hall. Paper from "Ductile Chromium and Its Alloys". American Society for Metals. 1957, p. 314-321. (Tn799.C5 Am35c)

Alloys of the composition 70 Cr, 30 Fe, 9 Mo, 2 to 3 Ti, and up to 0.5 Al (parts by wt.) have excellent high-temperature strength, and are forgeable in ingot sizes up to 12 lb. They do not show measurable ductility in room-temperature tests, but are malleable at room temperature, and show excellent resistance to thermal shock.

10303* (German.) Steels for High-Pressure Casting Dies and Molds. **Formenbaustähle für Druckgiesswerkzeuge und Kokillen.** H. Hiller. *Giesserei*, v. 44, Mar. 14, 1957, p. 141-149.

Effects of alloying elements. Thermal shock stress of the die steels, susceptibility to hot cracking, and other properties. Degree of deformation and orientation of the structure. Heat treatment.

10304* (Czech.) Producing Oil Line Pipes With a High Yield Point. **Výroba olejářských trubek s vysokou mezí prútažnosti.** Roman Šejnoha. *Hutník*, v. 7, Mar. 1957, p. 86-90.

Present conditions of production; mechanical properties and chemical composition of the steels; heat treatment.

10305* From Cabul to Cobalt. A Historical View of the "Mischievous Metal". F. R. Morral. *Journal of Chemical Education*, v. 34, Apr. 1957, p. 185-186.

Tracing the history of Co reveals the fact that in chemical compounds it has played an important part in man's civilization since antiquity. Its life as an industrial metal has been in existence for only some 50 yrs.

10306 High-Strength Zirconium Alloy: Zr-4 Wt Pct Sn-1.6 Wt Pct Mo. W. Chubb. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Apr. 1957, p. 461-468.

This alloy is readily rolled at 800 C and has more than four times the creep strength of pure Zr at 500 C. Tensile strength of the alloy in the annealed condition is about 90,000 psi., and it may be heat-treated to a strength of more than 140,000 psi. It is harder in the air-quenched condition than as water quenched.

10307 HM21XAT8- New High Temperature Magnesium Thorium Alloy. *Light Metal Age*, v. 15, Apr. 1957, p. 24 + 1 page.

Data on properties, welding, forming, and corrosion.

10308* (Dutch.) Copper and Copper Alloys. **Koper en Koperlegeringen. XVI.** Wrought Aluminum Bronzes. **Aluminiumkoper kneedlegeringen.** W. G. R. de Jager. *Metalen*, v. 12, Mar. 15, 1957, p. 86-88.

Composition and properties of Al-bronzes standardized in Germany, Great Britain, and the U. S. (To be continued.)

10309* (German.) Technology of Processing Scrap Metals Containing Zinc. **Zur Technologie der Aufarbeitung Zinnhaltiger Altmetalle.** H. Anders. *Metall*, v. 11, Apr. 1957, p. 305-306.

Discusses various methods of reclaiming white-metal scrap containing Pb, Sn, Sb, and Cu.

10310* (French.) Evolution of the Use of Molybdenum in the Manufacture of Steels in France. **Evolution de l'emploi du molybdène dans la sidérurgie fine française.** L. Colombier. *Métallurgie et la Construction Mécanique*, v. 89, Feb. 1957, p. 105 + 4 pages.

Resistance of stainless steels to various reagents; behavior of refractory steels at elevated temperature; effect of added Mo on hardenability, resistance to annealing, and reduction of brittleness.

10311 Vacuum Melting and Annealing. Roger Giler. *Metal Treating*, v. 8, Mar.-Apr. 1957, p. 14 + 3 pages.

Equipment, procedures, and applications.

10312 Castable Alloy for Highly Stressed Parts. *Precision Metal Molding*, v. 15, Apr. 1957, p. 41 + 4 pages.

Armco 17-4 PH, is an age hardenable corrosion resistant steel having a carefully balanced formula that gives exceptionally wide design latitude due to its good casting properties, ease of machining when fully annealed, and good strength characteristics when age hardened.

10313 High-Temperature Stainless. Edward A. Loria. *Product Engineering*, v. 28, Apr. 1957, p. 135-139.

Mechanical properties, structural stability, and fabrication of five austenitic and three martensitic alloys for 600 to 1400 F applications.

10314 New Materials by Irradiation. *Product Engineering*, v. 28, Apr. 1957, p. 167-174.

How metals and plastics are changed by irradiation; data on neutron-bombarded Al; graft copolymers by irradiation.

10315 Preparation, Properties, and Cladding of Aluminium-Uranium Alloys. H. A. Saller. Paper from "Progress in Nuclear Energy. Series V. Metallurgy and Fuels". v. I. Pergamon Press Ltd., 1956. p. 535-543 + 2 plates. (QC776 P94n)

The Al-U alloy system represents a very useful method of incorporating fuel into an alloy that is easy to fabricate and reasonably strong. Cladding these alloys with Al by the "picture-frame" technique produces a fuel element with good corrosion resistance in water. For most applications, ordinary melting and casting followed by hot fabrication are adequate.

10316 (German.) Metallurgical and Metallographic Problems of 12 to 15% Chromium Cast Steel. **Metallurgische und metallkundliche Probleme bei 12- bis 15 prozentigem Chromstahlguss. I.** Effect of Production Factors on Mechanical and Chemical Properties. **Einfluss der Zusammensetzung der Herstellungsbedingungen auf die mechanischen und chemischen Eigenschaften.** E. Zingg and Th. Geiger. *Schweizer Archiv für Angewandte Wissenschaft und Technik*, v. 23, Mar. 1957, p. 71-78.

Relation between chemical composition, corrosion resistance, structure, strength, and production methods.

10317* (Czech.) Use of Spheroidal Cast Iron and Its Heat Treatment. **Použití tvárné litiny a její základní tepelné zpracování.** Čestmír Hlousek. *Slévárenství*, v. 5; *Práce Československého Výzkumu Slévárenského*, v. 4, Mar. 1957, p. 293-300.

Data on different parts made from spheroidal cast iron, especially those for agricultural machines and motor cars. Chemical composition, heat treatment, hardness, and microstructure.

10318 Bibliography of Zirconium. Eleanor Abshire. *U. S. Bureau of Mines, Information Circular* 7771, Mar. 1957, 281 p. (TN21 Un3i)

Consists of references, with abstracts, to pertinent literature on the subject published from 1907 to 1955. Includes patents and subject and patent indexes.

10319 Watkins Cyclopedia of the Steel Industry. 6th Ed. 532 p. 1957. Steel Publications, Pittsburgh. (TN705 W32)

An up-to-date and comprehensive report on the activities of the steel producing and processing industries. Covers coal, coke, iron ore, blast furnace practice, steel-making operations, fabrication, finishing, joining, and heat treatment.

10320 Stainless Steel for Welded Pressure Vessels. A. Grodner. *Welding Journal*, v. 36, Apr. 1957, p. 169s-176s.

Properties and fabrication characteristics of wrought and cast stainless steels.

10321 Handbook on Titanium. Heinrich K. Adenstedt. *Wright Air Development Center, Materials Laboratory, WADC Technical Report* 54-305, pt. 1, Aug. 1954, sections individually paged. (TL507 Un3.18w Vis.)

A compilation of published and unpublished data on production, physical metallurgy, and properties of Ti and its alloys.

10322* (German.) Osmium-Chromium Alloys. **Die Osmium-Chrom-Legierungen.** Ernst Raub. *Zeitschrift für Metallkunde*, v. 48, Feb. 1957, p. 53-56.

Osmium-Cr alloys were investigated by X-rays and metallographic and hardness tests and their solubilities determined.

10323* (German.) Certain Results of High-Vacuum Process in Metallurgy. **Über einige Ergebnisse hochvakuumtechnischer Verfahren in der Metallurgie.** Werner Scheibe. *Zeitschrift für Metallkunde*, v. 48, Mar. 1957, p. 91-100.

Melting, sintering, and annealing methods in high vacuum. Influence of O, N, H, and on the strength of unalloyed and alloyed steels and the magnetic properties of Fe alloys.

See also: **9531** (chemical applications of Al); **10119** (Yugoslav bauxite reserves); **10575** (sintered Al alloy); **10675** (nuclear metallurgy).

METALS—CORROSION

10324* (German.) Tests on Corrosion of a Rustproof Steel With 13% Cr and 8% Ni in Acids and Acid Mixtures. **Untersuchungen über die Korrosion eines nichtrostenden stahles mit 13% Cr and 8% Ni in Säuren und Säuregemischen.** Willi Machu and M. G. Fouad. *Archiv für das Eisenhüttenwesen*, v. 3, Mar. 1957, p. 157-165.

Corrosion of steel with 0.12% C, 13.2% Cr, and 8.8% Ni in pure mineral acids and their mixtures. Influence of organic and inorganic inhibitors.

10325* (Russian.) Trans-Crystalline Corrosion in Sulfuric Acid of Stable Austenitic Acid-Resistant Steels and Welding Joints in a State of Compressive Deformation. **Transkristallitnaia korroziia v sernoi kislote stabil'noaustenitnykh kislotostoikikh stalei i svarnykh shvov, obuslovlennaia deformatsiei szhatiia.** *Avtomaticheskaia Svarka*, v. 10, Jan.-Feb. 1957, p. 46-50.

Describes a thermal treatment method as a preventive measure against corrosion.

10326 High-Temperature Oxidation and Contamination of Niobium. William D. Klopp, Chester T. Sims, and Robert I. Jaffee. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-1170, Feb. 1957, 22 p. (UF767 U3b Contin.)

Niobium oxidized in a linear manner when exposed to 1 atm. O at 600 to 1200 C. The heat of reaction was 5410 cal. per mole from 600 to 1100 C; above 1100 C the reaction was rapid. The oxide consisted of a thin black subscale of oriented Nb_2O_5 and NbO, and an outer layer of white, porous Nb_2O_5. Weight-change curves of Nb in air were also linear, with lower rates than in O. The heat of reaction was 10,100 cal. per mole in the range 600 to 1200 C. Contamination in the air- and oxygen-reacted samples was attributed to O diffusion.

10327 (French.) Electrochemical Behavior of Zirconium. pH-Tension Equilibrium Diagram of the Zr-H_2O System at 250 C. **Comportement electrochimique du zirconium diagramme d'équilibre tension-pH du système Zr-H_2O, à 25°C.** M. Maraghini, P. van Rysselberghe, E. Deltombe, N. de Zoubov, and M. Pourbaix. *Centre Belge d'Étude de la Corrosion, Rapport Technique*, no. 45, Jan. 1957, p. 1-10. (TA462 C33r Vis.)

On the basis of values of free energy of formation at 25 C of the different constituents of the Zr-H_2O system, a diagram was constructed as a function of the pH and of the electrode voltage, representing the corrosion behavior and passivation of Zr.

10328 (French.) Electrochemical Behavior of Arsenic. Equilibrium Diagram of pH vs. Tension of the As-H_2O System at 25 C. **Comportement electrochimique de l'arsenic diagramme d'équilibre tension-pH du système As-H_2O, à 25°C.** J. Van Muylder and M. Pourbaix. *Centre Belge d'Étude de la Corrosion, Rapport Technique*, no. 46, Feb. 1957, p. 1-14. (TA462 C33r Vis.)

On the basis of free standard enthalpy values of the various constituents, a diagram of this system was established as a function of the pH and of the electrode voltage at 25 C. Passivating action of the arsenical compound on Fe and ordinary steels in acid solution was determined.

10329 Prevention of Corrosion in Packaging and Storage: Some Methods of Testing of Packaging Materials. R. B. Turnbull. *Chemistry & Industry*, no. 15, Apr. 13, 1957, p. 446-451.

10330 Corrosion Mechanisms in the Plain Can. Ernest L. Koehler and Colleen M. Canonico. *Corrosion*, v. 13, Apr. 1957, p. 227t-237t.

A study of factors involved in the corrosion of plain tin cans. Effects of prune juice and peaches on tin and steel were studied.

10331 Corrosion Measurements in a Hydrogen Sulfide-Water Absorption Pilot Plant. B. W. Bradley and N. R. Dunne. *Corrosion*, v. 13, Apr. 1957, p. 238t-242t.

Killed carbon steel, stainless steel Type 304, Inconel, and K-Monel were resistant to sulfide stress corrosion cracking in sweetened sour natural gas.

10332 The Effect of Dissolved Oxygen on Corrosion of Steel and on Current Required for Cathodic Protection. Edward Schaschl and Glenn A. Marsh. *Corrosion*, v. 13, Apr. 1957, p. 243t-251t.

The interrelationship of corrosion rate of steel, dissolved oxygen concentration, agitation, electrode potential, and cathodic protection current density were studied under controlled laboratory conditions.

10333 Effect of Variables in Laboratory Testing of Corrosion Inhibitors for Refined Petroleum Products. David B. Boies and Jacob I. Bregman. *Corrosion*, v. 13, Apr. 1957, p. 277t-282t.

Variables studied should include degree of agitation, concentration of dissolved solids in the water phase, pH, temperature, O content, and nature of the hydrocarbon phase.

10334* (French.) Mechanism of Intercrystalline Corrosion in Soft Steel Produced by Ammonium Nitrate. **Sur le mecanisme de la corrosion intercristalline de l'acier doux par le nitrate d'ammonium.** M. Smialowski and T. Ostrowska. *Corrosion et Anticorrosion*, v. 5, Mar. 1957, p. 76-81.

A study of the effect of NH_4NO_3 solutions on Fe samples with fine or coarse crystals and under stress. Comparison of the behavior of single and polycrystals. Effect of atmospheric oxygen.

10335 Oxidation of 50 Weight Per Cent Uranium-Zirconium Alloy. Sidney Barnartt, Robert G. Charles, and Earl A. Gulbransen. *Electrochemical Society, Journal*, v. 104, Apr. 1957, p. 218-221.

Oxidation at 1 atm. pressure was studied over the range 200-500 C. The stable ϵ-phase and the quenched γ-phase, were reacted to an oxide-scale thickness of 0.1 mm. at the higher temperatures.

10336 Effect of Pre-Oxidation in Oxygen on the Steam Corrosion Behavior of Zircaloy-2. D. E. Thomas and S. Kass. *Electrochemical Society, Journal*, v. 104, May 1957, p. 261-263.

Zircaloy-2 exhibits the same behavior in oxygen and steam at 750 F. Transition is not associated with the pickup of H. Crystal bar Zr exhibits breakaway when exposed to steam. It exhibits neither breakaway nor transition when exposed to O.

10337 A Hydrogen Effusion Method for the Determination of Corrosion Rates in Aqueous Systems at Elevated Temperature and Pressure. M. C. Bloom and M. Krulfeld. *Electrochemical Society, Journal*, v. 104, May 1957, p. 264-269.

10338 Galvanic Corrosion. I. Current Flow and Polarization Characteristics of the Aluminum-Steel and Zinc-Steel Couples in Sodium Chloride Solution. M. J. Pryor and D. S. Keir. *Electrochemical Society, Journal*, v. 104, May 1957, p. 269-275.

10339 Logarithmic Transformations in the Analysis of Corrosion Data. H. C. Bowen, C. Groot, and J. L. Jaech. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-48753, Feb. 1957, 10 p. (UF767 Un3.1hw Contin.)

10340 Scaling of 18-8 Stainless Steel in Reheating Furnace Atmospheres. John Olof Edström. *Iron and Steel Institute, Journal*, v. 185, Apr. 1957, p. 450-466.

An explanation is given of the different influence of S on scaling in atmospheres containing excess of O compared with excess of CO or H.

10341* (German.) Description of a New Aerosol Corrosion Test Chamber. **Beschreibung einer neuen Korrosionsprüfkammer nach dem AEROSOL-Verfahren.** W. Hess. *IVA Tidskrift för Teknisk-Vetenskaplig Forskning*, v. 28, no. 1, 1957, p. 23-35.

10342 The Corrosion of Mild Steel by Aqueous Ammonium Thiocyanate. L. A. Ravald, J. W. Chilver, and R. Williams. *Journal of Applied Chemistry*, v. 7, Mar. 1957, p. 113-117.

The pH range for localized attack was wider with the more dilute solutions. Solid corrosion products were mixtures of black iron ferrocyanide and a ferrous sulfide. At 90 C in an oxygen-free atmosphere, corrosion was more severe than with NH_4Cl.

10343 Oxidation of Zirconium Between 400° and 800°C. Earl A. Gulbransen and Kenneth F. Andrew. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Apr. 1957, p. 394-400.

10344* (Russian.) Formation of Scale on Iron and Iron Alloys at High Temperatures. **Okalinoobrazovanie na zheleze i splavakh zheleza pri vysokikh temperaturakh.** V. I. Tikhomirov. *Leningradskogo Universiteta, Vestnik Seriia Fiziki i Khimii*, v. 12, no. 4, 1957, p. 85-101.

The process of wustite oxidation in air at high temperatures is shown to follow the parabolic law. The coefficient of diffusion of Fe through a wustite layer is calculated.

10345 The Current-Voltage Relationship of Galvanic Anode Arrays in Cathodic Protection. L. J. Waldron and M. H. Peterson. *Naval Research Laboratory, Report* 4891, Feb. 1957, 17 p. (T21 Un3.5n Contin.)

10346 Two-Phase Product Formed in the Reaction Between Fused Sodium Hydroxide and Inconel. G. P. Smith, M. E. Steidlitz, and E. E. Hoffman. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2129, Apr. 1957, 15 p. (UF767 U3o Contin.)

Reaction consisted of the selective leaching of Fe and Cr from their solid solution with Ni. The reaction product, a mixture of oxides and sodium oxysalts, grew in a network of narrow channels which, starting from the hydroxide-metal interface, penetrated along preferred paths into the underlying inconel.

10347 Corrosion Resistance of Metals and Alloys to Sodium and Lithium. E. E. Hoffman and W. D. Manly. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2271, Apr. 1957, 11 p. (UF767 U3o Contin.)

The austenitic (300 series) stainless steels are the most satisfactory structural materials for containing Na in systems which are to operate at temperatures below 1500 F. Oxygen is the most troublesome impurity. No structural alloy yet discovered is satisfactory as a container for Li in dynamic systems above 1200 F.

10348 (German.) Corrosion Tests of Sintered Iron. **Korrosionsversuche an Sintereisen.** A. Bukowiecki and U. A. Engster. *Schweizer Archiv für Angewandte Wissenschaft und Technik*, v. 23, Mar. 1957, p. 78-83.

Corrosion tests of two types of sintered iron in 3% NaCl/water solution. Comparison with iron sheets of the same chemical composition.

10349* (Norwegian.) High Temperature Oxidation of Metals and Alloys. **Høytemperaturoksydasjon av metaller og legeringer.** Per. Kofstad. *Teknisk Ukeblad*, v. 104, Mar. 21, 1957, p. 225-230; Mar. 28, 1957, p. 249-254.

Recent theories concerning the oxidation of metals and alloys at temperatures above 500 C. Principal requirements for the development of new oxidation-resistant alloys.

10350* (German.) The Corrosion of Soft Steel in Alkali Mono-and Alkali Hydrogen Fluorides. **Korrosion von Weichstahl in Alkalimono-und Alkalihydrogenfluoriden. I.** The Influence of the Concentration of the Solution Upon the Corrosion of Soft Steel. **Einfluss der Konzentration der Lösung auf den Angriff von Weichstahl.** W. Köhler. *Werkstoffe und Korrosion*, v. 8, Mar. 1957, p. 133-138.

10351* (German.) On the Behavior of Brass in Diluted Solutions of Mineral Acids and Their Mixtures in Presence as Well as in Absence of Inhibitors. **Über das Verhalten von Messing in verdünnten Mineralsäuren und deren Gemische in An- und Abwesenheit von Inhibitoren.** Willi Machu and M. G. Fouad. *Werkstoffe und Korrosion*, v. 8, Mar. 1957, p. 139-145.

10352* (German.) Electrochemical Elementary Processes in Stress Corrosion. **Elektrochemische Elementarprozesse bei der Spannungskorrosion.** H. Gerischer. *Zeitschrift für Elektrochemie*, v. 61, no. 2, 1957, p. 276-280.

An oscillographic examination of the rate of corrosion in wires of a Cu-Au alloy that were subjected to a tensile load and to a change in their length.

10353* (German.) Oxidation of Germanium. **Über die Oxydation von Germanium.** Oskar Rösner. *Zeitschrift für Metallkunde*, v. 48, Mar. 1957, p. 137-141.

Oxidation of variously crystallized Ge (single and polycrystals) of different purities was investigated in water, H_2O_2, Na_2O_2, HNO_3, $KMnO_4$, NaClO, air, and CO_2.

10354* (Russian.) Mechanism of Metal Corrosion in Narrow Crevices. **Mekhanizm korozii metallov v uzkikh zazorakh i shcheliakh. II.** Corrosion of Iron in Solutions of Corrosion Inhibitors. **Korroziia zheleza v rastvorakh zamedlitelei.** I. L. Rosenfel'd and I. K. Marshakov. *Zhurnal Fizicheskoi Khimii*, v. 31, Jan. 1957, p. 72-82.

In tests with solutions of $NaNO_2$, K_2CrO_7, Na_2HPO_4, and $ZnSO_4$ maximum corrosion was observed not at the crevices of minimal width, but at intermediate values, determined by the temperature, inhibitor concentration, and other factors.

10355* (Russian.) Rate of Cu Oxidation in Nitric Acid. **O skorosti okisleniia medi v azotnoi kislote.** N. N. Miliutin and A. I. Shultin. *Zhurnal Prikladnoi Khimii*, v. 30, Jan. 1957, p. 58-62.

Oxidation rates in HNO_3 of various concentrations is expressed quantitatively by the equation: $\phi = 0.195 + 0.056 \ln v$. Increase of temperature accelerates the oxidation process.

10356* (Russian.) Atmospheric Corrosion of Metals at Low Temperatures. **Atmosphernaia korroziia metallov pri nizkikh temperaturakh.** A. A. Dychko and K. A. Dychko. *Zhurnal Prikladnoi Khimii*, v. 30, Feb. 1957, p. 255-263.

Effect of temperature on atmospheric corrosion. Critical temperature of −25 C is found; below this point, the process of atmospheric corrosion is much slower.

See also: **9530** (dissolution of Mo, Zircaloy, and stainless steel); **9919** (scaling of steel); **9920** (oxidation of Mo); **10471** (corrosion of vanadium alloys); **10560** (corrosion of Al in HCl); **10875** (corrosion in Kraft digesters).

METALS—EXTRACTION AND REFINING

10357 The Removal of Copper From Iron-Copper-Carbon Melts. Fredrick C. Langenberg and Robert W. Lindsay. *American Iron and Steel Institute, Contributions to the Metallurgy of Steel, No.* 51, Mar. 1957, 47 p. (TN705 Am35c Vis.)

Copper content can be lowered by utilizing the immiscibility of Fe-Cu-C melts or by treatment with Pb or sodium sulfide slags.

10358* (German.) Reduction of Iron Ores With Gaseous Reducing Agents. **Über die Reduktion von Eisenerzen mit gasförmigen Reduktionsmitteln.** Mahmud Omar, Willi Machu, and Said Y. Ezz. *Archiv für das Eisenhüttenwesen*, v. 3, Mar. 1957, p. 117-122.

Structure of Egyptian iron ores from Asswan and Wady-Karim. Influence of temperature, gas velocity, size of particles, and porosity, upon the speed of reduction. Hydrogen and synthesis gas of petroleum refineries a usseful reducing agents.

10359 Arcs in Inert Atmospheres and Vacuum. W. E. Kuhn, editor. 188 p. 1956. John Wiley & Sons, New York. (QC705 K95a Over.)

A symposium of papers concerning arc melting fundamentals, design and operation of arc melting furnaces, chemical applications of arcs, and the past, present, and future of controlled atmosphere arc technology.

10360 Importance of Gas Solid Contact in the Production of Pig Iron. T. L. Joseph. *Blast Furnace and Steel Plant*, v. 45, Apr. 1957, p. 379-384.

Effect of arrangement of materials in the blast furnace. Gas velocities across various planes of the furnace. Variations in temperature as a result of uneven gas flow. Shaft temperature and iron analyses. (To be continued.)

10361 On the Mathematical Theory of Zone-Melting. I. Braun and S. Marshall. *British Journal of Applied Physics*, v. 8, Apr. 1957, p. 157-162.

A complete solution of the equations governing the redistribution of solutes in zone-melting processes. The effect of "normal freezing" in the last zone-length of a bar is treated rigorously.

10362 Zone Melting of Uranium. C. I. Whitman, V. Compton, and R. B. Holden. *Electrochemical Society, Journal*, v. 104, Apr. 1957, p. 240-244.

Zone melting has potential application in the removal of such impurities as B, Fe, Si, Ni, and Co from ordinary U. In the reprocessing of irradiated U, it offers a method for removing such fission products as Zr, Nb, and Ru, but shows little promise as a method for complete decontamination.

10363* (Russian.) Iron-Chromium-Aluminum Alloys as Resistors for Electric Furnaces. **Zhelezokhromoaliuminievye splavy soprotivleniia dlia elektropechei.** Sh. R. Zheleznikova. *Elektrichestvo*, no. 3, Mar. 1957, p. 60-61.

Application of Al-Fe-Cr resistors in electric furnaces at working temperatures of 1200 to 1300 C.

10364 Sodium Process Extracts Titanium in Commercial Tonnages. John Milton. *Iron Age*, v. 179, May 9, 1957, p. 120-122.

Sodium reacts with $TiCl_4$ to form raw Ti in small powder granules which can be pelleted with alloying materials into a form better suited for the difficult melting process.

10365 The H-Iron Process. A. M. Squires and C. A. Johnson. *Journal of Metals*, v. 9, sec. 1, Apr. 1957, p. 586-590.

Data from experience with a demonstration-scale plant for the direct reduction of Fe ore fines with H in fluidized beds, operating at temperatures below 1000 F, and at pressures above 200 psi.g.

10366 Hydrogen in Steelmaking Practice. Henry Epstein, John Chipman, and Nicholas J. Grant. *Journal of Metals*, v. 9, sec. 1; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Apr. 1957, p. 597-608.

A series of three acid open-hearth, two basic open-hearth, and seven basic electric furnace heats were examined through the refining period, at tap, and during pouring for variations in H content. The measured H content is the result of two competing processes, one of which drives H into the metal from the gas and slag phases and the other eliminating H through the CO boil.

10367 Zone Purification of Reactive Metals. R. L. Smith and J. L. Rutherford. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Apr. 1957, p. 478-484.

Apparatus and technique for the floating zone method. Analysis by radioactive tracers. Tensile results on Fe at liquid N and liquid He temperatures.

10368 The Floating-Zone Melting of Refractory Metals by Electron Bombardment. A. Calverley, M. Davis, and R. F. Lever. *Journal of Scientific Instruments*, v. 34, Apr. 1957, p. 142-147.

Apparatus produces floating liquid zones in vertical rods of refractory metals. Movement of the zone along the specimen can purify it in three ways, namely, outgassing on vacuum fusion, evaporation of volatile impurities, and segregation of impurities in the liquid zone.

10369* (Hungarian.) The Effect of Various Impurities in Dolomite on the Silica-Thermal Production of Metallic Magnesium. **A dolomit járulékos alkotói a szilikotermikus magnéziumkohászat szempontjából.** Károly Czakó. *Kohászati Lapok*, v. 11, Nov.-Dec. 1956, p. 524-525.

Effects; mechanism of action; admissible maximum and minimum impurity constituents in dolomite.

10370 Continuous-Cast Light Alloy Ingot Surfaces. P. N. Nielsen and V. Kondic. *Metal Industry*, v. 90, Apr. 12, 1957, p. 285-288.

Conditions controlling elimination of cracks and ripples.

10371* (French.) Recent Progress in Iron Ore Reduction Processes. **Récents progrès dans les procédés de réduction des minerais de fer.** Paul Thierry. *Métallurgie et la Construction Mécanique*, v. 89, Mar. 1957, p. 207 + 8 pages.

Improved efficiency of blast furnaces; increased production per unit; improved quality of pig iron. Processes which do not use furnace coke.

10372* (German.) On the Hydrogen Content of Steel. **Über den Wasserstoffgehalt des Stahles.** L. M. Jefimow. *Neue Hütte*, v. 2, Jan. 1957, p. 13-17.

Determination of H content; influence of blast moisture and of decarburization speed; application of O for the enrichment of combustion air.

10373* (French.) A New Process for Improvement of the Blowing in a Basic Bessemer Converter. **Nouveau procédé d'amélioration de la soufflabilité au convertisseur Thomas.** B. Trentini, P. Vayssière, D. Jorre, and M. Gombert. *Revue de Métallurgie*, v. 54, Feb. 1957, p. 147-158.

Lime powder is injected at the beginning of refining. The almost instantaneous action of this finely divided lime arriving at the place where the blast oxygen is acting on the bath stops the foaming of the primary slag.

10374* (Russian.) Blast Furnace Operation Under 1.3 Atmosphere Gage Top-Gas Pressure. **Rabota domennoi pechi na davlenii pod koloshnikom do 1,3 ati.** E. G. Tetereviatnikov and V. N. Andronov. *Stal'*, v. 17, Mar. 1957, p. 200-204.

10375* (Russian.) Melting of Structural Steel in the Electric Furnaces With the Use of Oxygen Lance. **Vyplavka konstruktsionnoi stali v elektropechakh s produvkoi kislorodom.** G. K. Komissarov, S. M. Gnuchev, V. P. Frantsov, G. F. Morenko, and Z. V. Klochkova. *Stal'*, v. 17, Mar. 1957, p. 228-232.

Use of O during the oxidizing period instead of iron ore does not deteriorate the metal quality and does not decrease the durability of the furnace.

10376* Zone Melting. A Physical Method for Controlling Impurities in Metals. Douglas H. Polonis. *Trend in Engineering (University of Washington)*, v. 9, Apr. 1957, p. 23-27.

Nature and effects of impurities; principles of zone melting; single and repeated pass zone refining; applications.

10377 Recovery of Tin and Tungsten From Tin-Smelter Slags. H. Kenworthy, A. G. Starliper, and L. L. Freeman. *U. S. Bureau of Mines, Report of Investigations* 5327, Mar. 1957, 12 p. (TN21 Un3r)

Fusion reduction, chloride volatilization, sulfide volatilization, and carbide formation were effective methods, each in conjunction with a reductant to break up the Sn-W slag complexes.

See also: **9518** (service life of ladle brick); **9672** (preparation of Po metal); **9902** (growth of Si crystals).

METALS—FINISHING, POLISHING, AND CLEANING

10378* (Dutch.) Spontaneous Elimination of Rust and "Rolling Skin". **Autogeen ontroesten en verwijdering van walshuid.** W. B. H. Jansen. *Bedrijf en Techniek*, v. 12, Mar. 23, 1957, p. 178 + 3 pages.

Flame cleaning using an acetylene-oxygen burner.

10379* (German.) The Technique of Descaling by Flames. **Die Technik des Entzunderns durch Flammstrahlen.** H. Wiegand, F. Nieth, and K. W. Sippell. *Metalloberfläche*, v. 11, Apr. 1957, p. 109-114.

Flame cleaning equipment, operation, and principles.

10380* (German.) Descaling of Heavy Plates by Flame Rays. **Die Entzunderung von Grobblechen durch Flammstrahlen.** Werner Neuhaus and K. W. Sippell. *Metalloberfläche*, v. 11, Apr. 1957, p. 120-127.

One-hundred heavy plates, manufactured under different conditions, were descaled by acetylene-oxygen flames. Relationship was established between the removability of scales and manufacturing variables.

10381* (French.) Pickling Before Galvanization. **Le décapage en galvanisation.** A. Herz. *Métallurgie et la Construction Mécanique*, v. 89, Feb. 1957, p. 125 + 1 page.

Comparative advantages and drawbacks of H_2SO_4 and HCl.

10382 Tarnish-Resistant Surface on Aluminum. F. M. Metrailer. *Precision Metal Molding*, v. 15, Apr. 1957, p. 52-55.

Barrel finishing can now prepare die cast Al parts for plating, or polish for direct use, without buffing.

10383* (German.) Single-Coat White Enamel Directly on Steel. **Einschicht-Weissemails direkt auf Stahl. III.** Problem of Pretreatment of Sheet Metal. **Fragen der Blechvorbehandlung.** Armin Petzold. *Sprechsaal*, v. 90, Apr. 1957, p. 152-155.

Critical evaluation of processes commonly used in the preliminary treatment of sheet metal for single-coat enameling.

See also: **10014** (brightening of Al); **10390** (cleaning of brass castings).

METALS—FOUNDRY PRACTICE

10384* Metal Losses in Crucible Melting Practice. R. S. Jackson and D. W. Brown. *British Foundryman*, v. 50, pt. 3, Mar. 1957, p. 103-109.

Measurements were made of metal losses during the melting of a number of commonly used Cu alloys in tilting and lift-out crucible furnaces, both oil-fired. Effects of various melting practices were examined.

10385* Mould Drying. *British Foundryman*, v. 50, pt. 4, Apr. 1957, p. 169-183.

Effects of moisture content, permeability, types of sand, temperature and time of drying, and methods of heating.

10386* Surface Sinking Defects in Grey Iron Light Castings. I. C. H. Hughes. *British Foundryman*, v. 50, pt. 4, Apr. 1957, p. 202-210.

Effects of composition, inoculation, and pouring temperature on occurrence of sinking defects under bosses attached to plate test castings 3/16 and 5/16 in. thick.

10387* (Italian.) Elimination of Porosity of Castings by Treatment With Inert Gases. **Eliminazione della porosità dei getti per trattamento con gas inerti.** *Fonderia*, v. 6, Jan. 1957, p. 19-21.

Using a current of pure N running through the mass of molten metal. Description of methods and application to non-ferrous alloys and stainless steels.

10388* (Italian.) Practical Studies on Shell Molding. **Studi applicativi sulla formatura a guscio.** *Fonderia*, v. 6, Feb. 1957, p. 49-54.

Sand granulation; cold strength of mold in relation to the type of resin used and temperature (620 and 930 C) resin segregation and its prevention; mold hardness and porosity; gas formation in relation to amount of resin.

10389* (Italian.) What Is Known and What Is Less Known About the Cupola Furnace. **Cose note e meno note sul cubilotto.** *Fonderia*, v. 6, Mar. 1957, p. 109 + 4 pages.

A short up-to-date theoretical and practical survey. Better results are obtained by correlating the size of coke with the internal diameter of the furnace.

10390 Cleaning Room Practice in the Brass Foundry. Harry St. John. *Foundry*, v. 85, May 1957, p. 168-170.

Removal of cores, grates, and sprues; cleaning of casting surfaces; sorting; corrective procedures and inspection.

10391 Dehumidification of the Cupola Blast. F. W. Jacobs. *Foundry*, v. 85, May 1957, p. 174-177.

Benefits to be achieved by removing moisture from cupola blast air.

10392 Which Core Process? Warner B. Bishop. *Foundry*, v. 85, May 1957, p. 180-183.

Advantages and disadvantages of processes in use today for making shell, conventional, air- and gas-setting cores.

10393 Elevated-Temperature Testing of Moulding and Core Sands and Correlation With Casting Quality. Harry W. Dietert, V. M. Rowell, and A. L. Graham. *Foundry Trade Journal*, v. 102, Mar. 28, 1957, p. 379-388.

General review. Attempts to fit research data into the context of daily foundry experience.

10394 Steel Foundry Moulding Materials. J. M. Middleton. *Foundry Trade Journal*, v. 102, Apr. 18, 1957, p. 469-475.

Survey of present trends in molding, coremaking methods, and materials, as applicable to general foundry practice.

10395* (German.) Measurement and Control on Cupolas. **Messen und Regeln an Kupolöfen.** Walter Ruppert. *Giesserei*, v. 44, Mar. 14, 1957, p. 153-160.

Measurement of volume, pressure, and humidity of the blast. Analysis of waste gases. Measurement and control of melt temperatures.

10396 (Swedish.) How to Design Light Metal Castings. **Hur skall ett gjutstycke i lättmetall konstrueras.** G. Lindh and R. Elg. *Gjuteriet*, v. 47, Feb. 1957, p. 19 + 4 pages.

Viewpoints on the correct way to design a gear cover in light metal in order to attain the best method of production. Sand casting, gravity, and pressure die casting.

10397 The Metallurgical Principles of the Control of Quality of Non-Ferrous Castings. R. W. Ruddle and A. Cibula. *Institute of Metals, Journal*, v. 85, Mar. 1957, p. 265-292 + 1 plate.

Flow of liquid metals through the gating system and into the mold cavity. The rate at which castings freeze, mechanisms of freezing in metals and alloys, and the bearing of these factors on the incidence of shrinkage porosity and on methods of feeding. Melt quality, including the control of gas content, grain refinement, elimination of non-metallic inclusions, and test-bar design.

10398 The Metallurgical Control of Quality in the Production of Copper-Base Alloy Castings. A. R. French. *Institute of Metals, Journal*, v. 85, Mar. 1957, p. 293-317 + 3 plates.

Constitution of the alloys; influence of basic composition and microstructure on properties; influence of impurities and reducing gases; alloying and melting practice; tests for metal quality; mode of solidification.

10399 Control of Quality in the Production of Nickel Alloy Sand Castings. D. R. Wood and J. F. Gregg. *Institute of Metals, Journal*, v. 85, Mar. 1957, p. 319-329 + 2 plates.

Compositional factors affecting properties. Methods of achieving the desired control, with particular attention to melting procedures.

10400 Vacuum Die Castings: Quality *In*, Porosity *Out*. E. J. Egan, Jr. *Iron Age*, v. 179, May 9, 1957, p. 107-109.

Vacuum die casting eliminates porosity, virtually guarantees a better product and fewer rejects.

10401* (Hungarian.) Experiences With Gas-Pressure Risers in Aluminum Metallurgy. **A gáznyemásos tápfejjel szerzett tapasztalatok az aluminiumöntészetben.** Zoltán Kum. *Kohászati Lapok*, v. 11, Nov.-Dec. 1956, p. 251-255.

Gas production by S content. Hungarian experiments with gas-pressure risers.

10402* (Hungarian.) Recent Data on the Application of Pectin and Possibilities for Further Development. **A pektin felhasználásának újabb tapasztalatai és a továbbfejlesztés lehetőségei.** György Szvath. *Kohászati Lapok*, v. 11, Nov.-Dec. 1956, p. 260-265.

Application as core binder for machine-tool castings. Formability; ease of mixing; impervious behavior toward atmospheric moisture; drying characteristics.

10403* Vibrating Strength Into Metals. A. H. Freedman and J. F. Wallace. *Modern Castings*, v. 31, Apr. 1957, p. 64-74.

Ultrasonics refines grain-size and develops tougher non-ferrous alloys.

10404* How to Mix Molding Sand Without Water. R. G. Megaw and K. A. Miericke. *Modern Castings*, v. 31, May 1957, p. 94-95.

Waterless mix bonded with oil and bentone adhesive produces high quality castings.

10405* Tin Is Not a Subversive Element in Gray Iron. J. A. Davis, D. E. Krause, and H. W. Lownie, Jr. *Modern Castings*, v. 31, May 1957, p. 96-98.

Additions of Sn act as a powerful stabilizer of pearlite, promoting wear resistance and machinability. The amount used is governed by the amount of ferrite in the base iron.

10406* (Polish.) The Properties of Molding Materials at Elevated Temperatures. **Własności materiałów formierskich w wysokich temperaturach.** *Przeglad Odlewnictwa*, v. 7, Mar. 1957, p. 65-76.

The compressive strength of natural and synthetic sands with clay bonds during slow heating is highest at 900 to 1000 C. In mixtures hardened chemically with CO_2 the maximum compressive strength is obtained in the range 450 to 1000 C. Formation of scabs on the casting is influenced by the thermal expansion and compressive strength up to 600 C on rapid heating.

10407* (German.) A New Method for Dry Recovery and Dust Removal From Foundry Sand. **Eine neue Methode zur trockenen Rückgewinnung und Entstaubung von Giessereisand.** Jules Kistler. *Staub*, no. 48, 1957, p. 35-40.

Chief aims of dry recovery process are the scarifying and stripping of the coatings of each individual sand corn and aspiration of the dust. A wet dust removal process is described.

See also: **9514** (properties of bentonites); **10432** (cast iron tests and specifications); **10580** (nondestructive testing of castings).

METALS—HEAT TREATMENT

10408 (English.) **Quench Hardening of Pure Gold as Observed by Internal Friction Methods.** A. E. Roswell and A. S. Nowick. *Acta Metallurgica*, v. 5, Apr. 1957, p. 228-235.

The difference between quenched and furnace-cooled specimens is observed to anneal out in the range 160 to 200 C. These phenomena are interpreted in terms of the pinning of dislocations by "attached vacancies" which are most probably in the form of clusters.

10409* (Czech.) Annealing Plates and Strips of Aluminum and Aluminum Alloys. **Žíhání plechů a pásů z hliníku a jeho slitin.** Otakar Rittich. *Hutník*, v. 7, Mar. 1957, p. 100-102.

A study of the best conditions for annealing aluminum and its alloys.

10410 How Long, How Fast to Heat Tool Steel. II. *Iron Age*, v. 179, Apr. 11, 1957, p. 118-121.

Basic pointers on heating rate, especially effects of shape, furnace atmospheres, circulation, molten media, and steel composition. Tests show internal structure does not affect heating rate.

10411 New Nitriding Process Uses Glow Discharge. P. M. Unterweiser. *Iron Age*, v. 179, May 2, 1957, p. 91-93.

Process doesn't use furnace or salt pot, is faster, and improves fatigue strength. Its heat is converted from electrical energy by means of glow discharge.

10412* (Russian.) Low Temperature Nitriding of Structural Steel. **Nizkotemperaturnoe azotirovanie konstruktsionnoi stali.** R. I. Mishkevich, P. I. Solntsev, and A. V. Smirnov. *Metallovedenie i Obrabotka Metallov*, no. 2, Feb. 1957, p. 49-54.

Developed low temperature nitriding process, using catalyzers, at 380 C (60-80 hrs.) and 430 C (24 hrs.). Results in Rockwell-C hardness of 42 to 50 at a depth of 0.20 to 0.25 mm. in structural alloy steel. Prevents temper brittleness.

10413* (Russian.) Isothermal Hardening of 50 KhG Spring Steel. **Izotermicheskaia zakalka ressornoi stali 50 KhG.** S. V. Trush. *Metallovedenie i Obrabotka Metallov*, no. 3, Mar. 1957, p. 60-62.

A study showing that the isothermal hardening of steel 50 KhG does not exclude tempering. In melted salts in combination with

tempering, such hardening improves the mechanical properties and decrease warping. It can advantageously replace the hot processing of spring plates.

10414 Control of Atmosphere Converters. Walter H. Holcroft. *Metal Progress*, v. 71, Apr. 1957, p. 104-108.

Atmosphere generators are economically controlled by proportioning the relative volumes of air and fuel gas pumped into them. Exothermic generators may be simply regulated by temperature or by the combustibles in the gas. Endothermic generators are best operated at constant output, wasting any temporary excess of gas, and controlling either H_2O or CO_2 content of the atmosphere.

10415 Controlling Atmospheres in Furnaces. Orville E. Cullen. *Metal Progress*, v. 71, Apr. 1957, p. 109-114.

Normal operating variables in atmospheres within the furnace can usually be ironed out by instrumentation controlling dew point according to time schedule (in batch-type furnaces) and by individual instruments at two or three zones controlling dew point of carrier gas and additions of carbonaceous gas or liquid (in continuous carburizing furnaces).

10416 Heat Treatment of Titanium. P. D. Frost. *Metal Treating*, v. 8, Mar.-Apr. 1957, p. 6 + 6 pages.

Current knowledge concerning methods of improving properties through solution and aging heat treatments, avoiding embrittlement by the omega phase after heating, avoiding loss of ductility due to overheating, and preventing contamination and distortion during heat treatment is summarized.

10417 Hot Oil Quenching. L. W. Kalinowski. *Metal Treating*, v. 8, Mar.-Apr. 1957, p. 10 + 6 pages.

The quenching process; equipment; oil requirements; advantages of oil as quenching medium.

10418* (French.) The Thermal Treatment of Aluminum-Zinc-Magnesium-Copper Alloys. **Remarques sur le traitement thermique des alliages aluminium-zinc-magnésium-cuivre.** M. Tournaire and G. M. Renouard. *Métaux, Corrosion-Industries*, v. 32, Mar. 1957, p. 95-101.

Tests were conducted in order to improve the plastic interval. Thermal homogenizing treatments were included.

10419* (German.) Temperature Distribution of, and Power Requirements for, Inductive Heat Treatment of Circumferential Welds on Steel Tubes. **Temperaturverteilung und Leistungsbedarf bei induktivem Glühen von Rundschweissnähten an Rohren aus Stahl.** Herbert Geisel. *Schweissen und Schneiden*, v. 9, Apr. 1957, p. 156-161.

10420 (German.) Design, Mode of Operation, and Operational Results of a Modern Wide Strip Annealing Plant. **Aufbau, Arbeitsweise und Betriebsergebnisse einer neuartigen Breitband-Glühstrasse.** Vincenz Seul and Joseph Billigmann. *Stahl und Eisen*, v. 77, Mar. 21, 1957, p. 309-323.

10421* (German.) Electric Resistance Heating for the Processing of Steel. **Elektrische Widerstandserhitzung zur Verarbeitung von Stahl.** Wilhelm Stich. *Stahl und Eisen*, v. 77, Apr. 4, 1957, p. 394-408.

Mode of action and design of the heating plant. Heating process and scaling. Quality of the surface, grain size and dissolution of the structure. Prospects for future application of this method.

10422 Controlled Atmospheres: A Survey of Their Types and Fields of Application in Metal Processing Operations. I. C. E. Peck. *Steel Processing and Conversion*, v. 43, Apr. 1957, p. 215 + 7 pages.

Furnace atmospheres for annealing various metals. (To be continued.)

10423* (Russian.) Application of Induction Heating in Spring Manufacturing. **Primenenie induktsionnogo nagreva v ressornom proizvodstve.** V. N. Bogdanov. *Vestnik Mashinostroeniia*, v. 37, Jan. 1957, p. 64-67.

Describes induction installation for heat treatment of spring steel using a frequency of 8000 cycles from two 100-k.v. generators. Operating data.

See also: **9903** (annealing of Ni coating); **10311** (vacuum annealing); **10340** (scaling of steel in reheating furnaces); **10448** (austenitizing alloy steel); **10466** (heat treatment of case-hardened steel); **10490** (heat treatment of weld seams).

METALS—MECHANICAL AND PHYSICAL PROPERTIES

10424* (Portuguese.) Dynamic Tensile Tests of Steel. **Ensaios dinâmicos de tração com aço.** R. M. Otto Weinbaum. *ABM (Boletim da Associação Brasileira de Metais)*, v. 13, Jan. 1957, p. 41-49.

Five notched specimens of mild steel were subjected to tensile tests. Each sample differed by the volume of the notched part. The greater the volume of the material tested, the greater the energy consumed by the fracture of the specimen.

10425* Dynamic Magnetostrictive Properties of Ni-Fe Alloys. C. M. Davis, Jr., H. H. Helms, and S. F. Ferebee. *Acoustical Society of America, Journal*, v. 29, Apr. 1957, p. 431-434.

10426 (English.) **Deformation and Fracture of Small Silicon Crystals.** G. L. Pearson, W. T. Read, Jr., and W. L. Feldmann. *Acta Metallurgica*, v. 5, Apr. 1957, p. 181-191.

Both whiskers grown from the vapor and rods cut from bulk Si were tested in bending over a range of temperature.

10427 (English.) **Single-Crystal Elastic Constants of Magnesium and Magnesium Alloys.** T. R. Long and Charles S. Smith. *Acta Metallurgica*, v. 5, Apr. 1957, p. 200-207.

10428 (English.) **Activation Energies for Creep of High-Purity Aluminum.** O. D. Sherby, J. L. Lytton, and J. E. Dorn. *Acta Metallurgica*, v. 5, Apr. 1957, p. 219-227.

From 500 to 880 K the activation energy was found to be independent of temperature and equal to 35,500 cal. per mole. Between 250 and 375 K the activation energy was about 27,500 cal. per mole.

10429 (English.) **Statistical Handling of Fatigue Data and Planning of Small Test Series.** Waloddi Weibull. *Aeronautical Research Institute of Sweden, Report* 69, 1957, 35 p. (TL504 F67m Vis.)

General regression formulas have been adapted for the purpose of evaluating data from fatigue tests.

10430* Effects of Pressure on Binary Alloys. V. Fifteen Alloys of Metals of Moderately High Melting Point. VI. Systems for the Most Part of Dilute Alloys of High Melting Metals. P. W. Bridgman. *American Academy of Arts and Sciences*, v. 84, no. 2, p. 131-216.

Data on shearing strength, electrical resistance, and linear compressibility of 15 alloys of metals with melting points up to 1500 C, and 19 dilute alloys of high melting metals.

10431 The Mechanical Properties of Zirconium and Zircaloy 2. Frederic R. Shober, John A. VanEcho, Lyle L. Marsh, Jr., and John R. Keeler. *Battelle Memorial Institute (U. S. Atomic Energy Commission)*, BMI-1168, Feb. 1957, 48 p. (UF767 U3b Contin.)

Elevated-temperature tensile properties were investigated and creep properties determined at temperatures up to 500 C. Increased tensile strengths of cold-worked Zr and Zircaloy 2 were reduced to that of the annealed material by holding at 500 C for approximately 90 and 200 hr., respectively. Cold-worked Zircaloy 2 tested in creep had superior 1000-hr. rupture strengths for all test temperatures, except 500 C when the 1000-hr. rupture strength reverted to that of annealed Zircaloy 2 at the same temperature. The stress to produce a creep rate of 10^{-5}% per hr. in the annealed Zircaloy 2 was 25,000 psi. at 150 C and 3200 psi. at 500 C. Hydraulic-bursting pressures were considerably higher in seamless tubes than in welded tubing.

10432* Cast Iron Tests and Specifications. *British Foundryman*, v. 50, pt. 3, Mar. 1957, p. 131-142.

Tensile tests are criticized and attempts made to overcome the difficulties arising from the effect of section thickness on strength.

10433* Some Features of the Metallurgical Properties of Steel Castings. W. J. Jackson. *British Foundryman*, v. 50, pt. 4, Apr. 1957, p. 211-219.

Effect of S and P content, non-metallic inclusion content, interdendritic segregation, and micro-porosity on ductility. Influence of chemical composition and heat treatment on low-temperature impact properties.

10434* An Investigation of the Fracture of Light Rolled-Steel Sections. K. J. Pascoe. *British Welding Journal*, v. 4, Mar. 1957, p. 133-146.

Machined notches and in some cases welds may be origins of fractures in light steel sections loaded in bending. If the temperature is below the transition temperature for the steel as shown by notch-bend tests the fractures are most probably brittle and sudden. Weld runs laid with extra heavy currents are more likely to cause fractures than with normal currents.

10435* A Summary of Recent Work on the Murex Hot-Cracking Test. P. W. Jones. *British Welding Journal*, v. 4, Apr. 1957, p. 189-197.

Effects of machine speed and size of fillet were determined. Impregnation of electrode coatings with S produced strong evidence for the deleterious effect of this element on resistance to hot cracking.

10436 Research on Properties of Rare Metals Final Report and Supplements. J. E. Goldman, Simon Foner, and George L. Guthrie. *Carnegie Institute of Technology, Laboratory for Magnetics Research (U. S. Atomic Energy Commission)*, NYO-7257, Aug. 1956, 36 p. (UF767 U3ny Contin.)

The Hall effect in Ti, V, Cr, Mn, Zr, and Hf. Development of calorimetric techniques leading to measurements on Zr.

10437* (Russian.) An Approximate Calculation of the Surface Tension of Metals. **Priblizhennyí raschet poverkhnostnogo natiazheniia metallov.** S. N. Zadumkin. *Doklady Akademii Nauk SSSR*, v. 112, Jan. 21, 1957, p. 453-456.

A calculation is presented which is based on the vaporization temperature of the metal.

10438 Properties of Iodide Chromium. R. J. Runck, T. E. Fearnside, J. M. Blocher, and I. E. Campbell. Paper from "Ductile Chromium and Its Alloys". American Society for Metals. 1957, p. 129-137. (TN799.C5 Am35c)

Purity seems to be the most important single factor affecting properties. High-purity metal is best obtained by thermal dissociation of the iodide, but the problem of contamination in fabrication is yet to be solved.

10439 Influence of Chromium Metal Purity on the Properties of Chromium Metal Alloys. D. J. Maykuth and R. I. Jaffee. Paper from "Ductile Chromium and Its Alloys". American Society for Metals. 1957, p. 229-246. (TN799.C5 Am35c)

Alloys of Cr with Ta, V, Mo, W, Cb, Fe, Ni, and Co were investigated, only the last three showing a significant range of workable composition. The Cr-rich Cr-Ni alloys show better combinations of strength and ductility than the other alloys tested. Oxygen, S, and N in commercial grade Cr have a detrimental effect on Cr-Fe and Cr-Ni alloys, particularly in a 61% Cr-39% Fe alloy where these contaminants produce both hot shortness and brittleness in room-temperature bending.

10440 The Mechanical Properties of Swaged Iodide-Base Chromium and Chromium Alloys. D. J. Maykuth and R. I. Jaffee. Paper from "Ductile Chromium and Its Alloys". American Society for Metals. 1957, p. 247-254. (Tn799.C5 Am35c)

The modulus of elasticity of Cr is 42,000,000 psi. at room temperature, which decreases to 36,000,000 psi at 800 C. The swaged and recrystallized Cr-base alloys with 50% Fe or Ni tested as bar stock, have excellent tensile ductility, but tensile ductility is low in an alloy with 40% Fe and is lost completely at 40% Ni.

10441 The Surface Tension of Binary Liquid Mixtures: Lead + Tin and Lead + Indium Alloys. T. P. Hoar and D. A. Melford. *Faraday Society, Transactions*, v. 53, Mar. 1957, p. 315-326.

Measurements by an improved capillary method at temperatures ranging from the melting points to 550 C.

10442* (Finnish.) Brittle Fracture in Mild Unalloyed Structural Steel. **Pehmeän seostamattoman rakenneteräksen haurasmurtuma.** J. E. Holmström. *Hitsaustekniikka Svetstekník*, no. 2, Mar. 1957, p. 29 + 8 pages.

A study of the fracture surface. Factors influencing the occurrence of brittle fracture. Orowan's theory of brittle resistance.

10443* The Specific Heats of Some Metallic Elements. I. Analysis of the Experimental Data. II. Approximate Theoretical Evaluation. III. The Characteristic Frequencies. C. V. Raman. *Indian Academy of Sciences, Proceedings*, v. 45, sec. A, Jan. 1957, p. 1-14; Feb. 1957, p. 59-64.

Includes data on Ag, Al, Cu, and Pb.

10444 The Melting Point of Niobium. T. H. Schofield. *Institute of Metals, Journal*, v. 85, Apr. 1957, p. 372-374.

The melting point of samples containing about 0.12% gaseous impurities (O and N) and 1.9% Tl is 2468 ± 10 C.

10445 The Physical and Mechanical Properties of Niobium. C. R. Tottle. *Institute of Metals, Journal*, v. 85, Apr. 1957, p. 375-378.

Thermal conductivity increases, and tensile properties decrease relatively slowly, with rise in temperature. Tensile properties are markedly affected by small additions of O and creep measurements are susceptible to serious error if O gains access to the system during long periods of test.

10446* The Fatigue Strength of Specimens Containing Cracks. N. E. Frost and C. E. Phillips. *Institution of Mechanical Engineers, Proceedings*, v. 170, no. 21, 1956, p. 713-725 + 2 plates.

Fatigue strength and strength-reduction factors of mild steel, Ni-Cr steel, and Al alloy specimens containing fatigue cracks, and tested under conditions of rotating-bending and reversed-direct stress.

10447 (French.) The Effect of Small Additions of Alloying Elements in a Chromium-Manganese-Silicium Steel. **Contribution à l'étude de l'influence de faibles additions d'éléments d'alliage dans un acier de base au chrome-manganèse-silicium.** F. Maratray and G. Delbart. *Institut de Recherches de la Sidérurgie, Publications*, ser. A, no. 151, Feb. 1957, 35 p. (Reprinted from *Revue de Métallurgie*, v. 53, Nov. 1956, p. 849-883.) (TN602 In7p Vis.)

Effects of Mo, V, B, Al, and Ti on temperability, brittleness, and other mechanical properties.

10448 (French.) The Effect of Austenitizing Temperature on Mechanical Properties and Temperability of a Steel Slightly Alloyed With Cr and V. **Étude de l'influence de la température d'austénitisation sur les caractéristiques mécaniques et la trempabilité d'un acier faiblement allié au Cr-V.** F. Maratray and G. Delbart. *Institut de Recherches de la Sidérurgie, Publications*, ser. A, no. 152, Feb. 1957, 15 p. (Reprinted from *Revue de Metallurgie*, v. 53, Nov. 1956, p. 884-896.) (TN602 In7p Vis.)

The steel contained 0.4% C, 1.0% Cr, and 0.125% V. It was heat treated at austenizing temperatures, between 825 and 975 C, in order to determine the best conditions for oil tempering.

10449 The Stress-Strain Characteristics of Uranium. David A. McCutchan and Glenn Murphy. *Iowa State College, Ames Laboratory (U. S. Atomic Energy Commission)*, ISC-700, Dec. 1955, 37 p. (UF767 Un3.1is Contin.)

Tests were made in reversed and repeated tensile loading on 13 specimens of rolled, alpha-uranium at room temperature. Constant strain rates ranging from 0.0003 in./in./min. to 0.0060 in./in./min. were employed.

10450 Specific Heat and Resistivity of Mild Steel. P. R. Pallister. *Iron and Steel Institute, Journal*, v. 185, Apr. 1957, p. 474-482.

10451 Gallium: Thermal Conductivity; Supercooling; Negative Pressure. Lyman J. Briggs. *Journal of Chemical Physics*, v. 26, Apr. 1957, p. 784-786.

10452 Prot Fatigue Study of an Aircraft Steel in the Ultra High Strength Range. P. W. Ramsey and D. P. Kedzie. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Apr. 1957, p. 401-406.

Fatigue data for a Ni-Cr-Mo-V steel (AMS-6434) in the tensile strength range up to 280 ksi.

10453 Some Properties of Certain High-Conductivity Copper-Base Alloys. Webster Hodge. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Apr. 1957, p. 408-412.

Properties of a Zr-Cu alloy were determined and compared with those of Ag-bearing Cu and Cr-Cu alloys that are used to make commutator segments. A Zr-Cu material containing 0.18% or more Zr was found superior for commutator manufacture.

10454 Effects of Solid Solution Alloying on Creep Deformation of Aluminum. Gordon D. Gemmell and Nicholas J. Grant. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Apr. 1957, p. 417-423.

Effects on creep-rupture properties, deformation characteristics, ductility, and fracture of pure Al were studied by means of creep-rupture tests on polished specimens of three alloys each of Al-Cu (0.24, 0.79, and 2.05% Cu), Al-Zn (4.93, 9.89, and 19.78% Zn), and Al-Mg (0.94, 1.92, and 5.10% Mg) at 500, 700, and 900 F.

10455 Flaking of Heavy Alloy Steel Sections. C. R. Garr and A. R. Troiano. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Apr. 1957, p. 445-449.

Potential antiflaking cycles were tested on a Cr-Ni-Mo steel. A cycle which was primarily an isothermal transformation in the pearlite range produced flake-free steel forgings in spite of extremely high H content.

10456 Effect of Small Amounts of Alloying Elements on the Ductility of Cast Molybdenum. L. E. Olds and G. W. P. Rengstorff. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Apr. 1957, p. 468-471.

The most effective addition for lowering the bend angle transition temperature of cast Mo containing limited amounts of O and N was Ti in amounts of 0.5 to 1%. Other additions in the order of their decreasing effectiveness were 10% Th, 0.026% Al, 0.1% Ce, 0.5% V, and less than 0.25% Zr.

10457 Crack Propagation in the Hydrogen-Induced Brittle Fracture of Steel. W. J. Barnett and A. R. Troiano. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Apr. 1957, p. 486-494.

An electrical resistance method was developed to permit analysis of the crack growth kinetics. The first stage was characteristic of crack growth through a pre-existent hydrogen-rich region (surface layer), while the second stage was associated with the gross inward diffusion of H. The third stage was associated with imminent fracture.

10458 Deformation of Magnesium Single Crystals by Nonbasal Slip. Robert E. Reed-Hill and William D. Robertson. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Apr. 1957, p. 496-502.

Studies at 25, 150, 190, and 286 C. Critical resolved shear stresses were evaluated at each temperature.

10459 Effect of Temperature on the Flow Stress and Strain-Hardening Coefficient of Magnesium Single Crystals. Hans Conrad and William D. Robertson. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Apr. 1957, p. 503-512.

10460 The Heat-Transfer and High-Temperature Properties of Liquid Alkali Metals. I. I. Novikov, et al. *Journal of Nuclear Energy*, v. 4, Mar. 1957, p. 387-408. (Translated from *Atomnaia Energiia*, v. 1, no. 4, 1956, p. 92.)

Data on Na, K, Li, and Na-K eutectic alloy.

10461* (Japanese.) **A Study of the Effects of Induction Hardening on Fatigue Strength. IV.** Hiroshi Nakamura, Shiro Ueda, and Tatsuo Amakasu. *Journal of Railway Engineering Research (Japan)*, v. 14, Feb. 15, 1957, p. 55-90.

Numerous tests indicate that the increase in fatigue strength of a notched specimen after induction hardening is due to compressive residual stress existing on the surface and development of toughness in the material due to rapid heating and cooling.

10462* Temper Brittleness of Boron-Treated Steels. Samuel J. Rosenberg. *Journal of Research, National Bureau of Standards*, v. 58, Apr. 1957, p. 175-187.

The presence of relatively small amounts of Ti as introduced into the test steels by the boron addition agents was sufficient to cause an impairment in the Charpy V-notch impact properties of the steels or an increased susceptibility to temper brittleness, or both. Additions of Zr had no effect.

10463* Tensile Properties of Copper, Nickel, and 70-Percent-Copper-30-Percent-Nickel and 30-Percent-Copper-70-Percent-Nickel Alloys at High Temperatures. William D. Jenkins, Thomas G. Digges, and Carl R. Johnson. *Journal of Research, National Bureau of Standards*, v. 58, Apr. 1957, p. 201-211.

10464 Hardness-Tensile Relationships for High Strength Aluminum Alloys. R. E. Kleint and G. B. Mathers. *Light Metal Age*, v. 15, Apr. 1957, p. 30 + 4 pages.

Good correlation may be established between hardness readings and mechanical properties of improperly processed 7075 Al alloy parts. This test method will permit salvaging aircraft parts which might otherwise have been scrapped.

10465 Creep Properties From Short Time Tests. Ervin E. Underwood. *Materials & Methods*, v. 45, Apr. 1957, p. 127-129.

A straight-line relationship between creep rupture stress and hot hardness permits determination of ultimate tensile strength, creep rupture stress, and time-to-rupture at a given temperature.

10466* (Russian.) The Effects of Tempering Before Annealing on the Properties of High Alloy Case Hardened Steels. **Vliianie otpuska pered zakalkoi na svoistva vysokolegirovannykh tsementovannykh stalei.** Iu. G. Vyshkovskii. *Metallovedenie i Obrabotka Metallov*, no. 2, Feb. 1957, p. 23-27.

Improvements resulting from a preliminary decomposition of the residual austenite at 350 C are especially advantageous when great depth of case hardening and rapid cooling after the case hardening are desired.

10467* (Russian.) Effects of the Sigma-Phase on Long-Time Heat Resistance of Alloys. **Vliianie sigma-fazy na dlitel'nuiu zharoprochnost' splavov.** E. E. Levin and E. M. Pivnik. *Metallovedenie i Obrabotka Metallov*, no. 2, Feb. 1957, p. 27-31.

Study on three Fe-base alloys. Effects of number, size, and distribution of the σ-phase particles on the mechanical properties of the metal.

10468 Metals for High-Speed Flight. Wolfgang H. Steurer. *Metal Progress*, v. 71, Apr. 1957, p. 66-73.

At very short periods of exposure to high temperatures, many metallic materials show properties far superior to those obtained in conventional tests. Consequently, they can often resist the transient heat conditions encountered in guided missiles and high-speed aircraft.

10469 Embrittlement (?) of Phosphated Steel. Harold P. Weinberg and Thomas J. Capello. *Metal Progress*, v. 71, Apr. 1957, p. 78-81.

Embrittlement of Cr-Ni-Mo steel, F.S. 4340 heat treated to high strength, by phosphate coating of either Zn base or Mn base can be prevented by aging 24 hr. at room temperature or by baking 1 hr. at 220 F.

10470 Fatigue Properties of Brasses, Bronzes and Bearing Metals. J. W. Cuthbertson. *Metal Treatment and Drop Forging*, v. 24, Apr. 1957, p. 159 + 3 pages.

Studies of backed and unbacked bearings; assessment of fatigue resistance; raising the fatigue resistance of various bearing alloys.

10471 Electrical, Thermoelectric, Hardness, and Corrosion Properties of Vanadium-Base Alloys. H. J. Cleary. *Nuclear Metals, Inc. (U. S. Atomic Energy Commission)*, NMI-1161, Sept. 1956, 34 p. (UF767 Un3.1nm Contin.)

10472* Mechanism of Dimensional Instability of Uranium. L. L. Seigle and A. J. Opinsky. *Nuclear Science and Engineering*, v. 2, Feb. 1957, p. 38-48.

It appears possible that significant changes in the shape and structure of α-U samples under irradiation are produced by the anisotropic diffusion of lattice imperfections to grain boundaries and free surfaces.

10473* (German.) New Testing Methods for Steel and Welding Materials for Use in Large Welding Constructions. **Neue prüfmethoden von Stählen und Schweisswerkstoffen für grosse Schweisskonstruktionen.** Henri-M. Schnadt. *Oerlikon Schweissmitteilungen*, v. 15, no. 26, 1957, p. 5-87.

Theoretical study of the behavior of welded metals including plasticity, elasticity, and deformation. Requirements; testing; evaluation of material and construction. Causes of weld fractures.

10474 Work-Hardening and Work-Softening of Face-Centred Cubic Metal Crystals. A. Seeger, J. Diehl, S. Mader, and H. Rebstock. *Philosophical Magazine,* v. 2, ser. 8, Mar. 1957, p. 323-350 + 4 plates.

10475 The Magnetic Susceptibility of α and β Brass. B. G. Childs and J. Penfold. *Philosophical Magazine,* v. 2, ser. 8, Mar. 1957, p. 389-403.

Magnetic susceptibility was measured at 77 and 300 K of a series of Cu-Zn alloys, ranging in composition from 0 to 47·6 at.% Zn, and of one Ag-Cd alloy containing 30·5 at.% Cd.

10476 (English.) **Thermal and Electrical Resistivity of Some Tungsten Single Crystals at Low Temperatures and in Strong Magnetic Fields.** J. De Nobel. *Physica,* v. 23, Mar. 1957, p. 261-269.

10477 Resistance Minimum of Magnesium: Electrical and Thermal Resistivities. D. A. Spohr and R. T. Webber. *Physical Review,* v. 105, ser. 2, Mar. 1, 1957, p. 1427-1433.

Two samples show a distinct electrical minimum in the temperature range of 1.5 to 25 K.

10478 Superconductivity of Microscopic Tin Filaments. Olin S. Lutes. *Physical Review,* v. 105, ser. 2, Mar. 1, 1957, p. 1451-1458.

Determined the magnetic fields necessary to induce the superconducting transition in tin filaments.

10479 Magneto-Thermal Effects in Nickel and Cobalt. R. S. Tebble and R. W. Teale. *Physical Society, Proceedings,* v. 70, no. 445B, Jan. 1957, p. 51-64.

10480 On the Complex Permeability of Iron-Nickel Alloys at High Frequencies. J. C. Anderson and B. Donovan. *Physical Society, Proceedings,* v. 70, no. 446B, Feb. 1957, p. 186-191.

Measurements between 300 and 400 Mc. per sec.

10481 The Effect of Eddy Currents on Nuclear Magnetic Resonance in Metals. A. C. Chapman, P. Rhodes, and E. F. W. Seymour. *Physical Society, Proceedings,* v. 70, no. 448B, Apr. 1957, p. 345-360.

Measurements on Al foils in the range 20 to 300 K. Effect of eddy currents on position of the center, shape, and amplitude of the absorption line.

10482 Metal Fatigue at High Frequency. E. A. Neppiras. *Physical Society, Proceedings,* v. 70, no. 448B, Apr. 1957, p. 393-401.

Metal samples were subjected to tension-compression stresses above the fatigue limit at frequencies around 18 kc. per sec. produced by a resonant magnetostriction transducer. The fatigue limit was appreciably higher than that obtained from L.F. measurements.

10483* The Properties of Tellurium-Alloy Lead Sheath for Power Cable. H. A. Hoover. *Power Apparatus and Systems,* no. 28, Feb. 1957, p. 1517-1525.

The alloy possesses excellent resistance to creep and bending fatigue and is superior to Cu-bearing Pb in these respects. It may be extruded over a wide range of extrusion temperatures and foundry practices.

10484* (French.) Relation Between the Geometrical Deformation of Al Single Crystals and Their Structure After Heat Treatment. **Relation entre la géométrie de la déformation de monocristaux d'aluminium et leur structure après traitement thermique.** B. Jaoul, I. Bricot, and P. Lacombe. *Revue de Métallurgie,* v. 54, Feb. 1957, p. 81-92.

Four characteristic types of deformation structures appear on the surface of slightly deformed single crystals of pure Al. Modifications of these crystals on heat treatment are not the same: recrystallization seems to be bounded with the slip intersections, while a complete recovery occurs if no secondary slip is visible.

10485* (French.) Influence of the Rate and Amplitude of Plastic Strains on the Behavior of Steel Containing Hydrogen. **Influence de la vitesse et de l'amplitude des déformations plastiques sur le comportement de l'acier chargé en hydrogène.** F. Bastien and P. Azou. *Revue de Métallurgie,* v. 54, Feb. 1957, p. 93-100.

10486* (French.) Simple Machines for the Determination of Creep Characteristics of Steels and Alloys. **Machines simples pour essais à chaud des aciers et alliages.** André Gueussier and René Castro. *Revue de Métallurgie,* v. 54, Feb. 1957, p. 101-106.

Regulating system makes it possible to maintain a constant temperature during several thousand hours and to make creep tests up to 1150 C.

10487* (French.) Results of Brittle Fracture Tests From the Viewpoint of the Constructor. **Résultats de quelques essais de rupture fragile considérés du point de vue de constructeur.** F. Hebrant, H. Louis, W. Soete, and A. Vinckier. *Revue de la Soudure (Brussels),* v. 13, no. 1, 1957, p. 31-48.

Brittle fracture tests were performed on steel disks in which an artificial defect was introduced and on iron-plate elements in th form of a cross and subjected to a double tension. The effects of the quality of steel place and nature of the defect, plate thickness, and other factors were examined.

10488* (German.) The Notch Impact Test. **Der Kerbschlagversuch.** K. Rühl. *Schweissen und Schneiden,* v. 9, Mar. 1957, p. 83-90.

Purpose and application of the test. Design of test specimens in different countries. Factors influencing results.

10489* (German.) Material Tests at Low Temperatures. **Die Werkstoffprüfung bei tiefen Temperaturen.** H. Hildesheimer. *Schweissen und Schneiden,* v. 9, Mar. 1957, p. 117-119.

Purpose of testing materials at low temperatures. Pre-cooling or cooling of the test specimens in the machine. Cooling devices and media.

10490 (German.) Mechanical Properties of Weld Joints on Steels Used in the Construction of Boilers and Containers, as Dependent on the Heat-Treatment. **Mechanische Eigenschaften von Schweissverbindungen an Stählen für den Kessel- und Behälterbau in Abhängigkeit von der Wärmebehandlung.** *Stahl und Eisen,* v. 77, Mar. 7, 1957, p. 279-290.

Effect of H on the formation of cold cracks and fish eyes during tensile test and suppression by special heat treatment of weld seams.

10491 (German.) The Effect of Different Conditions of Temper Rolling and of Aging on the Yield Point of Deep-Drawing Strip Steels. **Der Einfluss verschiedener Nachwalzbedingungen und der Alterung auf die Streckgrenze tiefziehfähiger Bandstähle.** Fritz Fischer, Matthias Nacken, and Vincenz Seul. *Stahl und Eisen,* v. 77, Mar. 21, 1957, p. 340-346.

Yield point curves of unalloyed steels low in C. Effect of temper rolling, roll diameter, lubrication, and aging.

10492* (Russian.) The Reasons for Variations of Steel Ductility at High Temperatures. **Prichiny kolebanii plastichnosti stali pri vysokikh temperaturakh.** M. N. Vinograd. *Stal',* v. 17, Mar. 1957, p. 254-260.

In certain cases, the negative influence of O content on ductility at high temperatures may be explained by the formation of easily-fusible dispersed inclusion-films containing SiO.

10493* (Spanish.) Quality in Steels. **Consideraciones sobre la calidad de los aceros.** Rafael Calvo Rodes. *Tecnica Metalurgica,* v. 12, Sept.-Oct. 1956, p. 157-163.

A study of breaking strength as a fundamental quality of steel. Various types of strains and fractures. Purity vs. quality.

10494 Rupture Strength of Several Nickel-Base Alloys in Sheet Form. James H. Dance and Francis J. Clauss. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3976, Apr. 1957, 24 p. (TL570 Un3t)

Strengths at 1200 and 1350 F of Inconel X and 700, Incoloy 901, Refractaloy 26, and R-235 sheet alloys were determined in both the annealed and heat-treated conditions. Inconel 700 was superior.

10495 Static Strength of Cross-Grain 7075-T6 Aluminum-Alloy Extruded Bar Containing Fatigue Cracks. Walter Illg and Arthur J. McEvily, Jr. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3994, Apr. 1957, 25 p. (TL570 Un3t)

Specimens were subjected to repeated axial loads until fatigue cracks of various lengths were formed. Small cracks resulted in disproportionately large reductions of static strength.

10496 Creep, Fracture, and Bending of Lead and Lead Alloy Cable Sheathing. Curtis W. Dollins and Cecil E. Betzer. *University of Illinois Bulletin (Engineering Experiment Station Bulletin No.* 440), v. 54, Nov. 1956, 44 p. (T1 I6b Vis.)

Special emphasis is placed on the newer As-Pb alloys where small amount of As, together with other minor constituents, and with proper production technique produce marked improvements in physical properties.

10497 Torsional Properties of Steels at High Rates of Strain. Paul G. Jones and Thomas J. Dolan. *University of Illinois Bulletin (Engineering Experiment Station Bulletin No.* 438), v. 54, Feb. 1957, 23 p. (T1 I6b Vis.)

Effects of strain rate, temperature, type of notch, and size of specimen on four steels tested in torsion.

10498* The Problem of Brittle Fracture. III. W. D. Biggs. *Welder*, v. 25, Oct.-Dec. 1956, p. 72-79.

Some fundamental ideas, concerning reasons for fracture at low stresses, crack propagation, and flow mechanism. (To be continued.)

10499 Investigation of the Mechanical Properties of Metal-Arc Welded Ti-6% Al-4% V. Daniel M. Daley, Jr. and Carl E. Hartbower. *Welding Journal*, v. 36, Apr. 1957, p. 185s-191s.

Alloy has satisfactory properties in the as-welded condition when matching filler and base metals are used. Tensile joint efficiency was approximately 100% with an ultimate strength of 150,000 psi.

10500* (Russian.) Volumetric Method of Investigating Hardening and Tempering of Steel. **Ob'emnyi metod issledovaniia zakalki i otpuska stali.** V. V. Abramov. *Zavodskaia Laboratoriia*, v. 23, no. 2, 1957, p. 196-201.

In ordinary dilatometric tests the changes in dimensions are very small. The author suggests a new manner of preparing the specimen, one which results in considerably greater values of volume changes. The method consists essentially of a two-layer specimen; one layer is the steel being studied and the other a steel containing less than 0.2% carbon.

10501* (Russian.) The Connection Between Hardness Under Compression and Hardness During Abrasion in Metals and Minerals. **O sviazi mezdu tverdost'iu pri vdavlivanii i tverdost'iu pri soshlifovyvanii metallov i mineralov.** M. M. Krushchov and M. A. Babichev. *Zavodskaia Laboratoriia*, v. 23, no. 2, 1957, p. 224-228.

Concludes that there is a regular relationship between relative resistance to wear and hardness under compression.

10502* (German.) The Activation Energy of the Viscosity of Molten Metals. **Die Aktivierungsenergie der Zähigkeit metallischer Schmelzen.** Anton Hrbek. *Zeitschrift für Metallkunde*, v. 48, Mar. 1957, p. 134-137.

Dependence of viscosity on temperature. Derivation of a general equation for determining activation energies. Data on Au, Pb, Zn, Sb, and Cu.

10503* (Russian.) The Dynamic Method of Determining Metal Vapor Pressures. **Dinamicheskii metod opredeleniia uprugosti parov metallov.** S. P. Detkov. *Zhurnal Fizicheskoi Khimii*, v. 31, Jan. 1957, p. 83-92.

In order that a sharper boiling point be obtained when using the dynamic method for metals, an additional resistance in the form of a diaphragm should be placed in the path of the vapor stream.

See also: **9536** (causes of brittle fractures); **9888** (thermodynamic properties of Ti-O mixtures); **10252** (surface roughness measurement); **10274** (fatigue testing machine); **10552** (radiation damage in Cu-Fe alloys); **10554** (electrical resistivity of Au); **10556** (thermal expansion of Cu and Au); **10562** (slip and twinning in Zn); **10566** (strength of Al Cu Mg and Al Zn Cu Mg alloys); **10735** (optical properties of Ag); **10810** (controlled fracture experiments); **10888** (hydrogen embrittlement of Ti); **10890** (hydrogen embrittlement of steel welds); **10895** (strength of joints); **10899** (ductility of Ti welds); **10909** (hardness testing); **10919** (strength of brazed Cu joints).

METALS—MECHANICAL WORKING

10504* (Portuguese.) The Continuous Cold Rolling of Steel Plates. **Laminação contínua a frio de chapas de aço.** Antonino Dória Machado. *ABM (Boletim da Associação Brasileira de Metais)*, v. 13, Jan. 1957, p. 5-40.

Study of cold rolling forces in action; importance of tension; lubricating and cooling process. Final treatment and prevention of various defects.

10505* Effect of Pressure Between Tool Tip and Workpiece on the Rate of Ultrasonic Machining in Ketos Tool Steel. Dieter Goetze. *Acoustical Society of America, Journal*, v. 29, Apr. 1957, p. 426-431.

10506* (English.) **Study on Wear Process of Carbide Tools.** Hidehiko Takeyama, Terumi Murai, and Eiji Usui. *Journal of Mechanical Laboratory (Japan)*, v. 2, no. 2, 1956, p. 14-24.

Characteristics of tool life when the high class cast iron FC27 and the Ni-Cr-Mo steel SNCM 3 are machined with *G* and *S* series carbides respectively.

10507 Latest Techniques in Extruding Aluminum. I. Charles H. Wick. *Machinery*, v. 63, May 1957, p. 143-147.

10508 Titanium Alloy Suited for Stretch Formed Parts. Eric J. Carr. *Materials & Methods*, v. 45, Apr. 1957, p. 140-141.

Preliminary tests indicate 6% Al-4% V alloy can be formed with standard tools and techniques.

10509 Use of Radioactive Tracers in the Investigation of Wear of Drop-Forging Dies. A Preliminary Investigation. D. B. Smith, H. Southan, and H. A. Whiteley. *Metal Treatment and Drop Forging*, v. 24, Apr. 1957, p. 131-136.

Method can give reasonably accurate measurements of the rate of die wear but its main use seems to be in assessing the various factors involved in die wear and in explaining its mechanism.

10510* (English.) **Study of the Influence of the Addition of Sulphur on the Machinability of a Medium-Carbon Steel.** Paul Bastien and Michel Weisz. *Microtecnic (English Ed.)*, v. 11, no. 1, 1957, p. 27-32.

Sulfur additions improve the conditions of formation and stability of a built-up edge. A mechanism is proposed.

10511* Deep Drawing Simplified. Kim Darby. *Modern Metals*, v. 13, Apr. 1957, p. 54 + 2 pages.

Flexible diaphragm replaces female die in Hydroform process; cuts tooling cost, setup time for long or short production runs; reduces or eliminates thin-out, spot stresses, spring-back and wrinkling.

10512 Forming Titanium and Titanium-Alloy Sheet by Stretching and Other Methods. Ralph A. Kiehl. *Sheet Metal Industries*, v. 34, Apr. 1957, p. 273-285.

Die materials and techniques; brake forming; stretch forming sections; stretching skins; mechanical-press and miscellaneous forming data.

10513 (German.) Work Hardening of Round Steel Wire When Using Different Methods of Shaping. **Über das Verfestigungsverhalten von Runddraht bei verschiedenen Verformungsarten.** Winfrid Dahl and Werner Lueg. *Stahl und Eisen*, v. 77, Mar. 21, 1957, p. 334-340.

10514* (Russian.) Multiple Cold Drawing of Tubes With the Application of Phosphatizing. **Mnogokratnoe kholodnoe volochenie trub s primeneniem fosfatirovaniia.** M. S. Goncharevskii, F. A. Danilov, S. S. Shaikevich, and P. K. Stasevich. *Stal'*, v. 17, Mar. 1957, p. 243-253.

Advantages of phosphatizing include improvement of the deformation process, raising productivity of the equipment, and saving of fuel, metal, and tools.

10515 Guide for Forging Stainless. W. E. McFee. *Steel*, v. 140, Apr. 15, 1957, p. 150-152.

Preheat and forging temperatures, soaking times, and cooling methods for Cr-Ni, martensitic Cr, and ferritic Cr steel forgings.

10516 (Czech.) Quality of Ground Surfaces. **Jakost povrchu při broušení.** J. Říčka. *Strojírenství*, v. 6, Dec. 1956, p. 823-830.

The finish of machine parts as a factor in determining their proper function. Surfaces obtained by grinding. Factors determining the roughness of ground surfaces. Basic technological conditions of grinding and their effect upon the finish.

10517* (Spanish.) Cutting Tool Maintenance. **Entretenimiento de herramientas de corte.** Arturo Bertoglio Cortella. *Tecnica Metalurgica*, v. 12, Nov.-Dec. 1956, p. 197-208.

Practical considerations on the maintenance of cutting tools; correct and frequent sharpening; cooling precautions; various types of whetstones.

See also: **9935** (automatic control of machine tools); **10293** (tool design); **10299** (deep-drawing steels); **10302** (forgeable Cr-Fe alloy); **10491** (rolling strip steel).

METALS—METALLOGRAPHY, TRANSFORMATIONS, AND STRUCTURES

10518 (English.) **Thermal Stabilization of Austenite in a 10% Ni 1% C Steel.** B. Edmondson. *Acta Metallurgica*, v. 5, Apr. 1957, p. 208-215.

10519* (German.) Photoelectric Examination of Non-Deformed and Plastically Deformed Aluminum Single Crystals. **Photoelektrische Untersuchungen an unverformten und plastisch verformten Aluminium-Einkristallen.** H. Müller and F. Weinberger. *Acta Physica Austriaca*, v. 10, no. 4, 1957, p. 409-420.

Non-deformed but etched or electrolytically polished Al samples showed an increase of the photoelectric boundary wavelength, independent of the crystal orientation.

10520* (German.) Stress Relief and Recrystallization of Aluminum. **Entfestigung und Rekristallisation des Aluminiums. I.** New Investigations. **Neuere Untersuchungen.** D. Altenpohl. *Aluminium*, v. 33, Apr. 1957, p. 226-233.

The processes which succeed one another during heating a cold-worked metal are: stress relief to onset of recrystallization; formation of recrystallization nuclei; growth of these nuclei from deformed crystals; continuous crystal growth with mutual distortion of the recrystallized grains; secondary recrystallization.

10521 X-Ray Diffraction Studies on Precipitates and Inclusions in Steels Using an Extraction Replica Technique. G. R. Booker, J. Norbury, and A. L. Sutton. *British Journal of Applied Physics*, v. 8, Apr. 1957, p. 155-157.

Included material is removed from the metal surface embedded in a thin plastic replica which is then formed into a small compact, cylindrical specimen suitable for powder cameras. Method is much quicker than bulk extraction techniques, does not require elaborate equipment, and only small amounts of the metal specimen are used.

10522 The Lattice Spacings of Nickel Solid Solutions. W. B. Pearson and L. T. Thompson. *Canadian Journal of Physics*, v. 35, Apr. 1957, p. 349-357.

New lattice spacing measurements in terminal Ni solid solutions with Cr, Mn, Co, Zn, Ga, Ge, In, and Sn solutes. Relationship of lattice distortion and depression of the solidus temperature.

10523 Lattice Distortion in Terminal Solid Solutions of the First Long Period Transition Metals and Copper. W. B. Pearson. *Canadian Journal of Physics*, v. 35, Apr. 1957, p. 358-362.

10524 Diffusion in Multicomponent Metallic Systems. J. S. Kirkaldy. *Canadian Journal of Physics*, v. 35, Apr. 1957, p. 435-440.

A set of non-linear differential equations is solved for the system Fe-C-Si.

10525 Some Scattering Problems in Conduction Theory. P. G. Klemens. *Canadian Journal of Physics*, v. 35, Apr. 1957, p. 441-450.

An expression is derived for the scattering of electrons by inhomogeneous strain fields in terms of the scattering of electrons by L.F. lattice vibrations, as deduced from the low temperature intrinsic thermal resistivity and the lattice thermal conductivity, and is applied to the scattering of electrons by dislocations and stacking faults.

10526* (French.) The Effect of Strains on the Allotropic Transformation of Cobalt. **Influence des contraintes sur la transformation allotropique du cobalt.** Hervé Bibring and François Sebilleau. *Comptes Rendus*, v. 244, Mar. 11, 1957, p. 1496-1499.

Test of mechanical strains showed that some dislocations of the crystalline network are dissociated and produce thin martensitic layers of the new phase. Most of the crystal is transformed without any homogeneous shearing.

10527* (Russian.) Some Data on the Heterodiffusion Coefficient in Cu-Ni, Fe-Ni, and Fe-Cr Alloys With Distorted and Undistorted Crystal Lattice. **Nekotorye dannye o koeffitsientakh geterodiffuzii v splavakh Cu-Ni, Fe-Ni, Fe-Cr s iskazhennoi i neiskazhennoi kristallicheskoi reshetkoi.** E. F. Chaikovskii. *Doklady Akademii Nauk SSSR*, v. 112, Feb. 1, 1957, p. 716-719 + 1 plate.

Diffusion coefficients are determined by X-ray studies.

10528* (Russian.) X-Ray Study of TiSi and TiGe. **Rentgenograficheskoe issledovanie kristallicheskoi struktury soedinenii TiSi i TiGe.** N. Ageev and V. Samsonov. *Doklady Akademii Nauk SSSR*, v. 112, Feb. 11, 1957, p. 853-855.

Using X-ray, chemical analyses, and determination of the lattice constants, the stoichiometry of TiSi was confirmed. No dissolved Ti and Si were found in the compound.

10529* (German.) Investigation on the Isothermal Transformation of Cast Iron Alloyed With Copper-Chromium, Nickel-Chromium, and 0.5% Molybdenum. **Untersuchung der isothermen Umwandlung des mit Kupfer-Chrom und Nikel-Chrom und 0,5% Molybdän legierten Gusseisens.** Albert De Sy and J. van Eeghem. *Giesserei*, v. 44, Apr. 11, 1957, p. 189-199.

Seven different types of cast iron were tested. Effects of Mo, Cu, Ni, and Cr on transformation curve. Relationship between time, temperature, and transformation. Effect of alloy additions.

10530 The Effect of Silicon on the Solubility of Nitrogen in Alpha- and Gamma-Iron. R. Rawlings. *Iron and Steel Institute, Journal*, v. 185, Apr. 1957, p. 441-449.

For low Si contents the solubility in both the γ-phase and the α-phase may be expressed by the equation $\log S_x/S_o = -Ax$, where S_x and S_o are solubilities in the Fe-Si alloy and in Fe respectively and X is the atomic fraction of Si. The value of A decreases with increase in temperature.

10531 Effect of Some Common Alloying Elements on the Breakdown of Martensite in a W.Q. 0.35% Carbon Steel. A. S. Kenneford and T. Williams. *Iron and Steel Institute, Journal*, v. 185, Apr. 1957, p. 467-474.

Nickel, Mn, Cr, Mo, V, and Co have little effect on the temperature range over which martensite decomposes into ferrite and cementite, but Cr, Mo, V, and Si delay softening during tempering.

10532 The potentiostat as a Metallographic Tool. C. Edeleanu. *Iron and Steel Institute, Journal*, v. 185, Apr. 1957, p. 482-488.

The instrument can be used for controlled etching, for the detection of susceptibility to intercrystalline corrosion, and in the study of phase diagrams.

10533* (English.) **Pressure-Induced Diffusion and Deformation During Precipitation, Especially Graphitization.** Mats Hillert. *Jernkontorets Annaler*, v. 141, no. 2, 1957, p. 67-89.

Effect of pressure on diffusion and precipitation in mild and alloy steel.

10534 Etching Behavior of Pile-Irradiated Germanium and Silicon Single Crystals. Roger Chang. *Journal of Applied Physics*, v. 28, Apr. 1957, p. 385-387.

Irradiated crystals when etched with CP-4 show a finer surface granulation. This difference in etching behavior is reduced on annealing. Kinematic studies indicate an activation energy for the annealing process between 1.6 and 1.8 e.v.

10535 Deposit Spot Patterns From Low-Index Planes of Metal Single Crystals in a New Theory of Cathode Sputtering. Erich B. Henschke. *Journal of Applied Physics*, v. 28, Apr. 1957, p. 411-420.

The generation of the deposit spot patterns from low-index planes at lower and higher ion energy is explained by mechanical double and triple collisions of the perpendicularly incident ions with lower and upper surface atoms of the target plane.

10536 Effect of Dissolved Oxygen on the Grain Size of Annealed Pure Copper and Cu-Al Alloys. D. L. Wood. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Apr. 1957, p. 406-408.

The grain growth restraint which occurs far in advance of the Al_2O_3 oxide front during the internal oxidation of Cu-Al alloys is shown to be a result of O in solid solution. Oxygen in solid solution in pure Cu restrains grain growth.

10537 Habit Planes of Martensite in Chrome-Carbon Steel. H. M. Otte and T. A. Read. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Apr. 1957, p. 412-417.

Observations on the scatter of the habit planes of martensite in a 2.8% Cr and 1.5% C steel.

10538 Central Region of the Mg-Zn Phase Diagram. J. B. Clark and F. N. Rhines. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Apr. 1957, p. 425-430.

In the region from O to 85 wt.% Zn and from 335 to 93 C four intermetallic phases, Mg_7Zn_3, MgZn, Mg_2Zn_3, and $MgZn_2$ exist.

10539 Electron Diffraction Study of Flake Graphite Extracted From Molten Pig Iron. Kichizo Niwa and Goro Shimaoka. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Apr. 1957, p. 430-434.

10540 Some Estimates of the Thermal Stability of Dispersion-Hardened Alloys. A. W. Cochardt. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Apr. 1957, p. 434-437.

The mechanism of overaging is explained, and the time is estimated in which structural changes should occur in alloys hardened with Ni_3Al, Al_2O_3, Fe_3C, TiC, and TiN.

10541 Grain Growth of Titanium Carbide in Nickel. Leonard P. Skolnick. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Apr. 1957, p. 438-442.

Three successive stages of growth were observed; formation of idiomorphic grains, spheroidization accompanied by rapid growth, and a period of coalescence and closer packing of the carbide grains. The primary mode of grain growth appears to be dissolution of high energy surfaces, transport of carbide through the liquid phase, and isothermal redeposition.

10542 Nucleation of Dislocation Loops by Cracks in Crystals. J. J. Gilman. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Apr. 1957, p. 449-454.

Dislocation loops are nucleated ahead of slowly moving cleavage cracks in LiF crystals. They are nucleated in dislocation-free regions of crystals. Loops larger than about 5μ diam. are stable at room temperature, but collapse at 400 C.

10543 Strain Induced Transformation in Beta Brass. T. B. Massalski and C. S. Barrett. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Apr. 1957, p. 455-461.

The β-phase of Cu-Zn and Cu-Zn-Ga alloys partially transforms when cold worked at low temperatures. X-ray data are presented on the new structures formed, on densities of stacking faults in them, on M_s temperatures, and on the tendency to revert to body-centered-cubic structure.

10544 Structural Changes Associated With Strain-Induced Grain Boundary Migration in Si-Fe. K. T. Aust and C. G. Dunn. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Apr. 1957, p. 472-478.

Microstructural data indicate that the region initially traversed by the moving grain boundary has many structural defects in the form of low-angle boundaries and random dislocations of relatively high density.

10545 Action of Vibration on Solidifying Aluminum Alloys. P. D. Southgate. *Journal of Metals*, v. 9, sec. 2; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Apr. 1957, p. 514-517.

Changes caused by acoustic energy include size reduction of intermetallic crystals, a decreased gravity segregation of these crystals, grain refinement, and porosity reduction. No large increases of tensile strength were observed.

10546 The $\beta \rightarrow \alpha$ Phase Change in Pure Uranium. B. R. Butcher. *Journal of Nuclear Energy*, v. 4, Mar. 1957, p. 273-278 + 1 plate.

The transformation is martensitically nucleated; the growth of the nuclei is probably martensitic.

10547* (French.) Diffusion in Metals. **Diffusie in metalen.** T. J. Tiedema and A. Bolk. *Metalen*, v. 12, Feb. 28, 1957, p. 60-64.

Matano's method for interpretation of the concentration-penetration curve. The Kirkendall effect and the method of Darken for calculation of partial diffusion coefficients. (To be continued.)

10548* (Russian.) The Kinetics of Carbide Dissolution During Induction Heating of Tungsten Steel. **Kinetika rastvoreniia karbidov vol'framovoi stali pri induktsionnom nagreve.** I. N. Kidin. *Metallovedenie i Obrabotka Metallov*, no. 2, Feb. 1957, p. 18-23.

Study of solubility of carbides in tungsten steel (1, 5, and 10% W and 0.6 and 1.0% C) during H.F. induction heating. The temperature of intensive solution is lower during induction heating than in ordinary heating. As the heating rate is increased, the temperature for complete solution of carbide increases.

10549* (Russian.) Sigma Phase in the Welded Joint of 25-20 Steel. **Sigma-faza v svarnom shve stali 25-20.** B. I. Medovar. *Metallovedenie i Obrabotka Metallov*, no. 3, Mar. 1957, p. 27-30.

A study of the sigmaphase in steel containing 25% Cr and 20% Ni after heating at 800 C for 850 and 300 hrs.

10550 Some Observations of the Effect of a Dispersed Oxide Phase on the Recrystallization of Copper. J. W. Martin. *Metallurgia*, v. 55, Apr. 1957, p. 161-165.

The activation energy for recrystallization is lowered by an amount increasing with silica content, and a similar effect was observed with decreasing grain size in unalloyed Cu. Results are discussed in terms of local lattice distortion produced at the particle-matrix interface by plastic deformation.

10551* (French.) A Study by Means of the Electron Microscope and Electron Diffraction on Tin-Iron Coatings on Tin-Plate. **Etude par microscopie et diffraction électroniques, des couches d'alliage étain-fer sur le fer blanc.** J. J. Trillat and K. Mihama. *Métaux, Corrosion-Industries*, v. 32, Mar. 1957, p. 102-110.

The structure of iron-tin alloy on tin plate was examined. The thicker the coating, the larger the size of the grains. There is a very thin and complex surface layer above the alloy $FeSn_2$. In a special case this layer existed on the surface of Fe_2Sn or Fe_2Sn.

10552 Effects of Radiation Damage on Precipitation-Hardening Alloys With Special Reference to Copper-Iron Alloys. Alvin Boltax. *Nuclear Metals, Inc. (U. S. Atomic Energy Commission)*, NMI-1165, Oct. 1956, 21 p. (UF767 Un3.1nm Contin.)

Neutron irradiation can accelerate solid state diffusion sufficiently to initiate precipitation or to allow growth of existing precipitates. Precipitation or growth caused by irradiation can lead to overaging. Small precipitate particles can be redissolved

during the local rearrangements of atoms caused by the neutron bombardment. Either overaging or re-solution will cause a decrease of strength and hardness.

10553 (English.) **The *P-T-x* Phase Diagrams of the Systems In-As, Ga-As and In-P.** J. van den Boomgaard and K. Schol. *Philips Research Reports*, v. 12, Apr. 1957, p. 127-140.

Determination of solid-liquid-vapor phase relations.

10554 Quenching Vacancies in Gold. F. J. Bradshaw and S. Pearson. *Philosophical Magazine*, v. 2, ser. 8, Mar. 1957, p. 379-383.

Increases in the electrical resistivity of Au wires due to quenching were measured and interpreted in terms of vacancies. The energy for vacancy formation was deduced to be 0·95 e.v. and the concentration of vacancies at the melting point 6 X 10^{-4}.

10555 Interference Effects in the Electron Microscopy of Thin Crystal Foils. W. Bollmann. *Physical Review*, v. 103, ser. 2, Sept. 1, 1956, p. 1588-1589.

Thin stainless-steel specimens were studied in the electron microscope by transmission. The specimens were produced by an electro-polishing technique. The contrast of the picture of crystal foils (steel grains) is determined mostly by electron diffraction effects. Not only differences in orientation, but also local lattice distortion, e.g. dislocation lines, become visible inside the material.

10556 Energy of Formation of Vacancies in Copper and Gold. P. Jongenburger. *Physical Review*, v. 106, ser. 2, Apr. 1, 1957, p. 66-69.

From the anomalous rise of the thermal expansion near the melting point, an energy value of about 0.7 e.v. is found.

10557 Precipitation of Cu in Ge. A. G. Tweet. *Physical Review*, v. 106, ser. 2, Apr. 15, 1957, p. 221-224.

The kinetics of precipitation of Cu from supersaturated solid solution in Ge were studied as a function of temperature and dislocation density. High temperature behavior is attributed to a diffusion-limited migration of Cu atoms to dislocations, in which the diffusion coefficient is that for dissociative diffusion of the Cu. On the low-temperature part of the curve the rate-limiting step is the dissociation rate of vacancies and Cu atoms.

10558* (English.) **On the Superstructure of the Ordered Alloy Cu_3Pd. II. X-Ray Diffraction Study.** Makoto Hirabayashi and Shiro Ogawa. *Physical Society of Japan, Journal*, v. 12, Mar. 1957, p. 259-271.

10559 (French.) A Contribution to the Study of the Properties and Decomposition Process of the Iron Oxide Phase. **Contribution a l'étude des propriétés et des modes de décomposition de la phase protoxyde de fer.** Robert Collongues. *Publications Scientifiques et Techniques du Ministère de l'Air*, no. 324, 1957, 82 p. (TL502 F84.1p Vis.)

Iron oxide, a typical non-stoichiometric compound, has the properties of a solid intermetallic solution. It decomposes below 570 C and has a structure similar to that of decomposed austenite. Structure of inclusions and Li ferrites.

10560 (French.) Application of Electron Microscopy to the Study of Certain Aspects of Crystal Surfaces and the Nature of Intergranular Boundaries in Aluminium. **Application de la micrographie électronique a l'étude de certains aspects de la surface des cristaux et de la nature des joints intergranulaires dans le cas de l'aluminium.** Pierre Bussy. *Publications Scientifiques et Techniques du Ministère de l'Air*, no. 325, 1957, 72 p. (TL502 F84.1p Vis.)

A study of the substructures appearing on the surface of Al crystals. Intercrystalline corrosion of Al in HCl. Properties of grain boundaries.

10561* (French.) A Non-Destructive Method of Macro and Micrographic Surface Examination. **Méthode non destructive d'examens macro et micrographiques superficiels.** P. A. Jacquet and A. Van Effenterre. *Revue de Métallurgie*, v. 54, Feb. 1957, p. 107-125.

Transparent replica and local electrolytic polishing techniques allow macro and micrographic superficial examination of any shape and size pieces without sampling.

10562 The Dynamics of Twinning and the Interrelation of Slip and Twinning in Zinc Crystals. R. L. Bell and R. W. Cahn. *Royal Society, Proceedings*, v. 239, ser. A, Apr. 9, 1957, p. 494-521 + 4 plates.

Zinc crystal wires in which the basal plane was nearly parallel to the wire were found to twin at abnormally high stresses. No single reproducible critical shear stress for the creation of a twin lamella, this stress depending on geometry and orientation of the specimen. All crystals experienced detectable plastic deformation before twinning, for which the critical resolved shear stress in tension was 1.0 to 1.5 kg. per mm^2. Observations suggest that slip is the necessary prelude to the nucleation of a twin. An existing twin can help to create others. Aging leads to a slow reduction of the high stresses needed to produce basal slip in the twinned crystals. Basal slip is accompanied by considerable work-softening.

10563* (German.) Significance of Carbide Dissolution for Austenitization and Behavior in Transformation of Tool Steels. **Bedeutug der Karbidauflösung für die Austenitisierung und das Umwandlungsverhalten von Werkzeugstählen.** Adolf Rose and Leo Rademacher. *Stahl und Eisen*, v. 77, Apr. 4, 1957, p. 409-421.

Dissolution phenomena during austenitization as dependent on composition. Time and temperature of austenitization. TTT-diagrams for two austenitizing temperatures of hypoeutectoid, eutectoid, and hypereutectoid tool steels. Hardenability and tempering behavior of these steels.

10564 High Temperature X-Ray Diffraction Studies on Uranium Hydride and UBe_{13}. Edward J. Goon, John T. Mason, and Thomas R. P. Gibb, Jr. *Tufts University (U. S. Atomic Energy Commission)*, NYO-7545, Feb. 1957, 22 p. (UF767 Un3ny Contin.)

X-ray powder diffraction study of uranium hydride at elevated temperatures and high gas pressures. Formation of UBe_{13} by solid phase interaction of Be and U metals.

10565 Evaluation of Approaches to the Study of the Physical Nature of Metallic Surfaces. M. K. Testerman. *Wright Air Development Center, WADC Technical Report No.* 56-233, 1957, 63 p. (TL507 Un3.18w Vis.)

A direct approach is considered the most feasible, using the de Broglie matter waves with a theoretical resolution of 0.75 A, in studying the actual rather than the effective topography.

10566* (German.) Investigation of the Structure and Strength Properties of Stamped Items of AlCuMg- and AlZnCuMg-Alloys. **Untersuchungen über den Gefügeaufbau und die Festigkeitseigenschaften von Gesenkpressteilen aus AlCuMg- und AlZnCuMg-Legierungen.** Wilhelm Rosenkranz. *Zeitschrift für Metallkunde*, v. 48, Feb. 1957, p. 41-53.

The influence of pressing, forging, temperature, and solution heat treatment on macrostructure and static and dynamic strengths of wedge shaped Al-Cu-Mg and Al-Cu-Mg-Zn alloy specimens.

10567* (German.) Hexagonal Order-Disorder Transformation in the Systems Ti-Al and Ti-In. **Hexagonale Ordnungsphasen in den Systemen Titan-Aluminium und Titan-Indium.** Kurt Anderko, Konrad Sagel, and Ulrich Zwicker. *Zeitschrift für Metallkunde*, v. 48, Feb. 1957, p. 57-58.

X-ray studies show the ordered hexagonal phases Ti_3In and Ti_3Al which are isotopic and completely miscible in each other.

10568* (German.) Gallium-Germanium System. **Zur Kenntnis des Systems Gallium-Germanium.** Ninon de Roche. *Zeitschrift für Metallkunde*, v. 48, Feb. 1957, p. 59-60.

The liquidus line and the entropies of melting of Ga and Ge are calculated from a review of the phase diagram.

10569* (German.) Interpretation of the K-State of Resistance Alloys. **Beitrag zur Deutung des K-Zustandes von Widerstandlslegierungen.** Horst Guido Müller and Horst Alfred Schulze. *Zeitschrift für Metallkunde*, v. 48, Feb. 1957, p. 72-79.

Homogeneous Ni-Fe-Cr alloys were investigated in the K-state by X-rays and electrical conductivity measurements. The formation of the K-state was accompanied by a lattice contraction.

10570* (German.) Detection of Inclusions and Grain Boundaries in Zinc by Thermal Etching. **Nachweis von Verunreinigungen und Korngrenzen durch thermisches Ätzen von Zink.** Sigmar German. *Zeitschrift für Metallkunde*, v. 48, Feb. 1957, p. 79-80.

Study of a homogeneous gray residue consisting mainly of Zn found after thermal etching of Zn single crystals.

10571* (German.) Three-Dimensional Structural Observations on Eutectic Alloys. **Gefügebeobachtungen in drei Dimensionen an eutektischen Legierungen.** Frederick N. Rhines and Walter F. B. Timpe. *Zeitschrift für Metallkunde*, v. 48, Mar. 1957, p. 109-115.

From binary eutectic alloys, one component was dissolved by means of selective chemical or electro-chemical solution treatment and the remaining component was observed under the microscope. Experiments were carried out on Al-Si, Ag-Si, Sb-Si, Na-Ag, and Pb-Ag alloys.

10572* (German.) Field Electron Microscopic Observations of Allotropic Transformations in Cobalt. **Feldelektronenmikroskopische Beobachtung der allotropen Umwandlung von Kobalt.** Otto Buhl and Claus Schüler. *Zeitschrift für Metallkunde*, v. 48, Mar. 1957, p. 116-118.

The β-α phase transition of Co was investigated in a pulse-field driven field emission microscope.

10573* (Russian.) A Study of the Iron-Nickel-Cobalt System in the Region of Metallic Compounds Ni_3Fe and FeCo. **Issledovanie sistemy zhelezo-nikel'-kobal't v oblasti metallicheskikh soedinenii Ni_3Fe i FeCo. I.** The Metallic Compound Ni_3Fe and Its Region in the Iron-Nickel System. **Metallicheskoe coedinenie Ni_3Fe i oblast' ego sushchestvovaniia v sisteme zhelezo-nikel. II.** The Region of the Metallic Compound Ni_3Fe in the Iron-Nickel-Cobalt System. **Oblast' sushchestvovaniia metallicheskogo coedineniia Ni_3Fe v troinoi sisteme zhelezo-nickel-kobalt.** L. M. Viting. *Zhurnal Neorganicheskoi Khimii*, v. 2, Feb. 1957, p. 366-382.

Phase diagrams are plotted, based on thermal analysis, microstructure, Vickers' hardness, and electric resistance.

10574* (Slovak.) Gray Cast Iron Welding Metallography. **Metalografia zvárania sivej liatiny.** Ivan Hrivňák. *Zváranie*, v. 6, Mar. 1957, p. 75-77.

The effects of Si, Mn, P, S and other elements on the structure of cast iron. The graphitizing mechanism in the welding zone. Effects of composition of cast iron on weld quality.

See also: **9636** (electron probe microanalyzer); **9861** (diffusion of Ni in NiO); **9865** (diffusion of Zn in ZnO); **9877** (helical dislocations in CaF_2); **9894** (surface potential of AgBr); **10000** (structure of films on InSb); **10018** (electrolytic polishing of specimens); **10096** (self diffusion in Ge); **10408** (crystal structure of Au); **10472** (diffusions of dislocations in uranium); **10484** (structure of deformed Al); **10492** (inclusions in steel); **10768** (diffusion of lattice defects).

METALS—POWDER

10575* (German.) S. A. P.—The Sintered Aluminum Material of High Hot Strength. **S.A.P.—Der Aluminium-Sinterwerkstoff mit hoher Warmfestigkeit.** R. Irmann. *Aluminium*, v. 33, Apr. 1957, p. 250-259.

This material does not recrystallize and therefore neither fatigue nor static strengths fall to zero even after prolonged heating at up to about 500 C. It also has higher electrical and thermal conductivities and lower thermal expansion than Al alloys.

10576* (German.) Effect of Initial and Ensuing Pressures, and of the Sinter Temperature on Properties of Sintered Parts From Industrial Iron Dust. **Einfluss des Vor- und Nachpressdruckes sowie der Sintertemperatur auf die Eigenschaften von Sinterteilen aus technischen Eisenpulvern.** Gerhard Bockstiegel. *Archiv für das Eisenhüttenwesen*, v. 3, Mar. 1957, p. 167-177.

Specific weight, tensile strength, electric conductivity, and compressibility of sintered samples from four different iron powders which were produced partially by electrolytic method, partially by reduction, and partially by mechanical crushing—as a function of pressure (3 to 9t/cm^2) and sinter temperature (up to 1250 C). Evaluation of test results.

10577 Powder Metallurgy. VIII. Factors Affecting Growth and Porosity in Sintering. J. F. C. Morden. *Metal Industry*, v 90, Apr. 5, 1957, p. 265-268.

Effects of time, temperature, particle characteristics, gas adsorption and evolution, compacting pressure, powder stresses, recrystallization, diffusion, and furnace atmosphere.

10578 6th Annual Powder Metallurgy Directory. *Precision Metal Molding*, v. 15, Apr. 1957, p. 69 + 23 pages.

Typical properties of powdered compacts. Some pointers for the designer and the cost estimator on feasibility and costs of production. A listing of companies who fabricate parts, manufacture metal powders, or supply equipment for the industry.

10579* (Russian.) Obtaining Metal-Ceramic Hard Alloys on the Basis of Chromium, Titanium, and Tungsten Borides. **O vozmoshnosti polucheniia metallokeramicheskikh tverdykh splavov na osnove boridov khroma, titana u volframa.** I. I. Iskol'dskii and L. L. Bogorodskaia. *Zhurnal Prikladnoie Khimii*, v. 30, Feb. 1957, p. 177-185.

It was not possible to obtain these alloys by using Co, Ni, and Fe as cementing metals because of the reactions between them and the borides of Cr and Ti.

See also: **9530** (applications of ultrasonics); **10323** (vacuum sintering procedures); **10348** (corrosion of sintered Fe).

NONDESTRUCTIVE TESTING AND QUALITY CONTROL

10580 Non-Destructive Testing in the Control of Quality of Non-Ferrous Castings. S. L. Fry. *Institute of Metals, Journal*, v. 85, Apr. 1957, p. 361-366 + 8 plates.

Factors affecting quality of radiographs; radiographic procedure and defects revealed by it.

10581* (Russian.) A Rapid Inspection Method for High Pressure Steam Pipe. **Uskorennyí metod kontrolia metalla paroprovodov vysokogo davleniia.** N. E. Karskiĭ. *Metallovedenie i Obrabotka Metallov*, no. 3, Mar. 1957, p. 8-15.

A study of structural change and of heat resistance of steels in relation to phase and chemical compositions of ferrite.

10582* Applications of Nondestructive Testing to Fuel Elements for Nuclear Reactors. W. J. McGonnagle, Stuart McLain, and E. C. Wood. *Nondestructive Testing*, v. 15, Mar.-Apr. 1957, p. 86-90.

Applications of various nondestructive tests to check bond and weld integrities, tubing, clad thickness, grain size, and orientation. The isothermal frost test.

10583* Inspection of Small-Diameter Tubing by Eddy-Current Methods. J. W. Allen and R. B. Oliver. *Nondestructive Testing*, v. 15, Mar.-Apr. 1957, p. 104-109.

10584* (French.) Automatic Inspection in the Mill of Mild Steel Billets by Electromagnetic and Ultrasonic Methods. **Inspection automatigue en usine de billettes d'acier doux par les méthodes électromagnétique et ultrasonore.** V. Husarek and L. Beaujard. *Revue de Métallurgie*, v. 54, Feb. 1957, p. 135-146.

10585 Evaluation of the Use of Electrical Resistance for Detecting Overtemperatured S-816 Turbine Blades. Leonard Robins. *U. S. National Advisory Committee for Aeronautics, Research Memorandum*, E57A29a, Mar. 1957, 22 p. (TL782 Un3rm Vis.)

Overtemperature cannot be detected without a knowledge of a blade's resistance history, and then only severe overtemperatures can be detected.

See also: **10017** (inspection of electrodeposits).

NUCLEAR PHYSICS, NUCLEONICS, AND RADIATION

10586* (English.) **Two Sided Spark Counters With Large Counting Area for Registering Slow Neutrons.** J. A. Janik and A. Szkatuła. *Acta Physica Polonica*, v. 15, no. 5, 1956, p. 343-349.

Counter has cathode area of 7.5 x 11 cm.² and is covered on both sides by a coating of boron. As CO_2 concentration in the air increases, the counter efficiency increases, the plateau length decreases, and the slope of the characteristic increases.

10587 Determination of Burnout Limits of Polyphenyl Coolants. K. Sato. *Aerojet-General Corporation (U. S. Atomic Energy Commission)*, AGC-AE-32, Feb. 1957, 68 p. (UF767 Un3.lg Contin.)

Burnout limits of liquid diphenyl were determined by failure of an electrically heated tube within which the flow was controlled.

10588 Engineering, Construction and Cost of the Argonaut Reactor. R. H. Armstrong, W. L. Kolb, and D. H. Lennox. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL-5704, Mar. 1957, 43 p. (UF767 Un3.1an Contin.)

This is a low cost, versatile thermal heterogeneous reactor with an annular core, with internal and external reflectors, and with water moderation. The maximum flux is about 5×10^{13} neutrons per cm. per sec. at a power level of 10 kw. The critical loading is about 4 kg. of U^{235}.

10589 Atomic Quest. Arthur Holly Compton. 370 p. 1956. Oxford University Press, New York. (QC773.A1 C73a)

A narrative of the author's part in wartime development of the atomic bomb and peacetime uses of nuclear energy.

10590* (German.) The Detection of Harmful Radiations. **Der Nachweis Schädlicher Strahlen.** Julius Bosch. *Atomwirtschaft*, v. 11, Mar. 1957, p. 81-84.

Details of measuring and recording instruments.

10591* (German.) Risks in the Handling of Radioactive Isotopes. **Das Risiko beim Umgang mit Radioaktiven isotopen.** R. Berthold and O. Vaupel. *Atomwirtschaft*, v. 11, Mar. 1957, p. 88-94.

The calculated "risk figures" are useful in obtaining data for the correct assessment of radiation hazards.

10592 The Calculation of Atomic Structures. Douglas R. Hartree. 181 p. 1957. John Wiley & Sons, New York. (QC174.5 H25c)

Emphasizes methods of obtaining calculations based on the best approximations available.

10593 Variations in the Amounts of Positronium Formed in Liquids and Amorphous Solids. R. E. Green and R. E. Bell. *Canadian Journal of Physics*, v. 35, Apr. 1957, p. 398-409.

10594 Photoneutron Emission From Th^{232}, U^{233}, U^{238}, Pu^{239}. L. Katz, K. G. McNeill, M. LeBlanc, and F. Brown. *Canadian Journal of Physics*, v. 35, Apr. 1957, p. 470-476.

Measurements of emission under irradiation by letatron X-rays of various energies up to 23 m.e.v.

10595* (German.) Design of Heavy-Water Reactors for Heat and Power Generation. **Entwurf von Schwerwasserreaktoren für Wärme- und Kraftwerke.** P. H. Margen. *Chemie-Ingenieur-Technik*, v. 29, Mar. 1957, p. 161-165.

10596 New Approach to the Quantum-Mechanical Analysis of the Electronic Structures of Molecules. The Method of Deformed Atoms in Molecules. Tadashi Arai. *Journal of Chemical Physics*, v. 26, Mar. 1957, p. 435-450.

10597 Neutron Diffraction Study of Calcium Hydroxide. William R. Busing and Henri A. Levy. *Journal of Chemical Physics*, v. 26, Mar. 1957, p. 563-568.

Single crystal neutron diffraction measurements at 20 and −140 C confirm the X-ray structure and the H positions previously postulated. The O–H distance, after allowance for asymmetric thermal motion, is 0.984 A.

10598 Frequency Dependence of Proton Spin Relaxation in Aqueous Solutions of Paramagnetic Ions. A. W. Nolle and L. O. Morgan. *Journal of Chemical Physics*, v. 26, Mar. 1957, p. 642-648.

10599 Scattering of Low Velocity Molecular Beams in Gases. Edward A. Mason. *Journal of Chemical Physics*, v. 26, Mar. 1957, p. 667-677.

A large number of partial and total molecular scattering cross sections were calculated numerically for molecules obeying an exp-six potential, consisting of an exponential repulsion term and an inverse sixth power attraction term. The tabulations cover a wide range of scattering angles, energies, and potential parameters.

10600 Heavy Isotope Buildup in the Core of a U^{233} Breeder. R. W. Stoughton and J. Halperin. *Journal of Nuclear Energy*, v. 4, Mar. 1957, p. 279-292.

10601 Parallel-Plate Spark Counters for Measuring Short Time Intervals. M. V. Babykin, A. G. Pakhov, Y. F. Skachkov, and V. V. Shapkin. *Journal of Nuclear Energy*, v. 4, Mar. 1957, p. 345-352 + 2 plates. (Translated from *Atomnaia Energiia*, v. 1, no. 4, 1956, p. 38.)

Construction details. Characteristics of counters filled with A and diethyl ether vapor.

10602 Long-Term Reactivity Changes in Nuclear Reactors. B. L. Ioffe and L. B. Okun. *Journal of Nuclear Energy*, v. 4, Mar. 1957, p. 371-386. (Translated from *Atomnaia Energiia*, v. 1, no. 4, 1956, p. 80.)

Method of calculating fuel burnup takes account of capture and multiplication of the neutrons in the courses of slowing down. Calculations are performed which allow for the burnup of U^{235} and the formation and burnup of Np^{239}, Pu^{239}, Pu^{240}, Pu^{241}, and fission products.

10603* (French.) Nucleon-Nucleon Diffusion by Means of Non-Central Forces. **Diffusion nucléon-nucléon par des forces non centrales. II.** Proton-Proton Diffusion. **Diffusion proton-proton.** M. Gourdin. *Journal de Physique et le Radium*, v. 18, Feb. 1957, p. 85-91.

Hamiltonian functions were searched to obtain real phase angles. Two identical particles were brought together which resulted in the application of Pauli's principle of exclusion.

10604* (French.) Reversibility and Irreversibility in Nuclear Resonance. **Réversibilité et irréversibilité en résonance nucléaire. I.** Theory of Nuclear Relaxation in Liquids. **Théorie de la relaxation nucléaire dans les liquides.** Joseph Seiden. *Journal de Physique et le Radium*, v. 18, Mar. 1957, p. 173-192.

10605* (French.) A Proportional Counter Using Recoil Protons for the Spectrometry of Fast Neutrons. **Compteur proportionnel a protons de recul pour spectrométrie de neutrons rapides.** P. Marguin and M. A. Moussa. *Journal de Physique et le Radium (Suppl.)*, v. 18, Mar. 1957, p. 1A-9A.

A study of the energy distribution in a fast neutron beam was carried out by detecting the recoil protons produced by a thin hydrogenated radiator. Description of the spectrometer used, having a suitable collimation of the incident neutrons and of the recoil protons.

10606* (French.) A Scintillation Spectrometer for the Study of α, β, and γ Radiations in Coincidence. **Spectromètre a scintillation pour l'étude des rayonnements α, β, γ, en coincidence. I.** R. Foucher, L. Dick, N. Perrin, and H. Vartapetian. *Journal de Physique et le Radium (Suppl.)*, v. 18, Mar. 1957, p. 54A-57A.

A study of the slow discrimination of energy in a spectrometer of the slow-rapid type. Response of the instrument to intensity and energy of the radiations detected; response of the amplifiers. Optimum conditions for use.

10607 The Measurement of the Momenta of High Energy Charged Particles in a Diffusion Cloud Chamber. B. B. Culwick. *Journal of Scientific Instruments*, v. 43, Apr. 1957, p. 154-158.

10608 Relaxation Times and Magnitudes in the Thermal Bowing of Fuel Element Jackets. W. C. Cohen and J. K. Davidson. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-1690, Jan. 1957, 25 p. (UF767 Un3.1ka Contin.)

The transient behavior of a two-section fuel element consisting of a UO_2 core surrounded by a stainless steel cladding was analyzed. Mechanical bowing effects associated with the thermal expansion of the stainless steel tubing are too small and the relaxation time too great for the mechanism to be effective in providing a prompt negative temperature coefficient.

10609 Reports to the AEC Nuclear Cross Sections Advisory Group. *Los Alamos Scientific Laboratory (U. S. Atomic Energy Commission)*, WASH-192, Mar. 1957, 39 p. (UF767 Un3.1w Contin.)

Reports on the work of various laboratories in measuring neutron cross sections.

10610 Radium and Mesothorium Poisoning and Dosimetry and Instrumentation Techniques in Applied Radioactivity. *Massachusetts Institute of Technology (U. S. Atomic Energy Commission)*, AECU-3261, May 1956, 97 p. (UF767 U3au Contin.)

10611* (German.) Isotopes, Their Structure and Analysis. **Isotope, ihre Herstellung und Messung.** W. Walcher. *Naturwissenschaften*, v. 44, Mar. 1957, p. 132-144.

Separation and measurement of radioactive isotopes.

10612 The Transient Behavior of a Prototype Reactor Fuse in Simulated Reactor Excursions. N. E. Huston and R. R. Eggleston. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1761, Mar. 1957, 63 p. (UF767 Un3.1na Contin.)

The response time of the trigger element as a function of reactor period was greater than anticipated.

10613 Preliminary Results on the Kinetic Behavior of Water Boiler Reactors. D. L. Hetrick, et al. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1896, Apr. 1957, 20 p. (UF767 Un3.1na Contin.)

Radiolytic decomposition gas is approximately seven times as effective as thermal expansion in limiting a neutron burst in a water boiler reactor at atmospheric pressure, provided the burst is rapid enough that most gas bubbles remain in the solution until after peak power is attained, and provided the dynamic pressures achieved are not large enough to interfere with the effect of gas bubbles on the reactivity.

10614* Field Stabilization in a D.C.-A.C. Excited Magnet of a Synchrotron. G. Ghigo and I. F. Quercia. *Nuclear Instruments*, v. 1, Mar. 1957, p. 57-61.

Device is sensitive to the difference between peak a.c. and d.c. and keeps this difference constant by controlling the value of the d.c.

10615* Fine Time-Structure of Beams From the Birmingham Proton Synchrotron. N. E. Booth and G. W. Hutchinson. *Nuclear Instruments*, v. 1, Mar. 1957, p. 80-85.

10616* A Target Box for Bombardment of CF_4 in Gaseous or Solid Form. P. B. Treacy and N. F. Bowkett. *Nuclear Instruments*, v. 1, Mar. 1957, p. 86-89.

Examples are given of pulse spectra obtained from solid CF_4 and from a conventional target of CaF_2.

10617* Precision Quantameter for High Energy X-Rays. Robert R. Wilson. *Nuclear Instruments*, v. 1, Mar. 1957, p. 101-106.

10618 Nuclear Reactors for Research. Clifford K. Beck. 267 p. 1957. D. Van Nostrand Co., Princeton. (QC776 B38n)

Up-to-date world wide information on various kinds of research reactors, selected from the important papers presented at the Geneva Conference.

10619* Determination of the Neutron Temperature at the Center of the Thermal Test Reactor. G. B. Gavin. *Nuclear Science and Engineering*, v. 2, Feb. 1957, p. 1-3.

Assuming that the thermal neutrons have a Maxwellian velocity distribution, experiments indicated that the TTR neutrons have a temperature of 300 K.

10620* Heat Transfer and Economic Considerations for Selecting Core Sizes and Configurations. R. E. Behmer and B. L. Hoffman. *Nuclear Science and Engineering*, v. 2, Feb. 1957, p. 14-23.

An analytical procedure for evaluating and correlating various heat transfer and economic parameters in order to optimize core size and configuration in the design of heterogeneous reactors.

10621* A Direct Measurement of the Uranium Metal Temperature Coefficient of Reactivity. R. M. Pearce and D. H. Walker. *Nuclear Science and Engineering*, v. 2, Feb. 1957, p. 24-32.

Measurements show that over the range +30 to +230 C the coefficient is $-(1.25 \pm 0.09) \times 10^{-5}$ per degree C. Over the range +10 to −140 C the coefficient is $-(1.58 \pm 0.18) \times 10^{-5}$ per degree C.

10622* Fast Neutron Damaging in Nuclear Reactors. I. Radiation Damage Monitoring With the Electrical Conductivity of Graphite. W. Primak and L. H. Fuchs. *Nuclear Science and Engineering*, v. 2, Feb. 1957, p. 49-56.

10623* Nuclear Warfare—A Bibliography, June 1955-June 1956. 96 p. 1956. Engineer School Library, Fort Belvoir, Va. (ZQC776 Un3.24n Ref.)

Lists a large number of references covering all pertinent subjects.

10624 Pressurized-Water Test Loop at MTR. Emil L. Martinec. *Nucleonics*, v. 15, Apr. 1957, p. 73-77.

Sixty gpm. of reactor-grade water at 1,500 psi. and 500 F flow past test samples in a thermal flux of 2.5×10^{14} n/cm²/sec. in Argonne's loop for in-pile testing of reactor materials.

10625 Gamma-Ray Dose and Heating From Spent MTR Fuel Elements. W. E. Francis and L. L. Marsden. *Nucleonics*, v. 15, Apr. 1957, p. 80-83.

Given irradiation history of element, γ dose rate can be calculated. Verification of heat calculations awaits more accurate calorimetry.

10626* (English.) **A Calculation on the Structure of the Nucleonic Cascade in the Atmosphere.** M. Oda. *Nuovo Cimento*, v. 5, ser. 10, Mar. 1957, p. 615-627.

Hypothetical models of the nucleonic cascade were used for interpreting cosmic ray air showers. Numerical calculations were made on energy and angular distributions of π-mesons and μ-mesons produced at each generation of the nucleonic cascade.

10627* (English.) **Non-Local Models of Pion-Nucleon, Pion-Hyperon Interactions.** P. Budini and L. Fonda. *Nuovo Cimento*, v. 5, ser. 10, Mar. 1957, p. 666-683.

10628* (English.) **A Geiger Counter Design Giving a Definite Counting Length.** P. J. Grouse and H. D. Rathgeber. *Nuovo Cimento*, v. 5, ser. 10, Mar. 1957, p. 706-716.

10629* (English.) **Coulomb Excitation of Heavy Nuclei.** J. O. Newton. *Nuovo Cimento (Supplemento)*, v. 4, ser. 10, no. 3, 1956, p. 1156-1161.

10630* (English.) **Nuclear Reactor Physics.** A. M. Weinberg. *Nuovo Cimento (Supplemento)*, v. 4, ser. 10, no. 3, 1956, p. 1278-1323.

Application of nuclear theory to chain reactor; mathematical theory of chain reaction; reactor kinetics.

10631* (English.) **"Zephyr"—Zero Energy Fast Reactor.** T. M. Fry. *Nuovo Cimento (Supplemento)*, v. 4, ser. 10, no. 3, 1956, p. 1324-1328.

Control-system; conversion factor; perturbation measurements.

10632* (English.) **The Displacement of Atoms in Solids by Radiation.** T. M. Fry. *Nuovo Cimento (Supplemento)*, v. 4, ser. 10, no. 3, 1956, p. 1329-1334.

10633 A Series of Thermal, Epithermal and Fast Neutron Measurements in the MTR. J. B. Trice. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, CF-55-10-140, Oct. 1955, 88 p. (UF767 Un3.1cf Contin.)

Design, construction, and operation of a pneumatic facility for rapid and safe transfer of materials into and out of the high-level neutron field. Development of a series of very small fission chamber probes using threshold fission reactions in very intense radiation fields. Flux data in the HB-3 position.

10634 The Reactivity Effect of an Air Tank Against One Face of the Bulk Shielding Reactor. E. B. Johnson, K. M. Henry, and J. D. Flynn. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2179, Mar. 1957, 27 p. (UF767 U3o Contin.)

Both the Cd and the boral curtains tested are quite effective in shielding the reactor from changing conditions in the void, the boral being slightly more effective. Even with a neutron-absorbing curtain, extreme conditions of fast-neutron backscattering from equipment within the void could result in a positive reactivity change of more than +2%.

10635 Maintenance of Primary Coolant Water Quality in the Materials Testing Reactor. III. Maintenance of Coolants. J. H. Rainwater. *Phillips Petroleum Co., Idaho Operations Office (U. S. Atomic Energy Commission)*, IDO-16322, Feb. 1957, 54 p. (UF767 Un3.1id Contin.)

Fission products and U plate out on reactor components quite readily, thus creating a continuous source of fission products even though the original source is removed. Data show the effectiveness of using a cation resin bed in removing fission products from the system.

10636 (English.) **Delays in Proportional Counters.** H. C. Hamers, G. J. Sizoo, A. Marseille, and Th. J. De. Boer. *Physica*, v. 23, Mar. 1957, p. 225-235.

Delays in proportional counters, filled with A alcohol, A *n*-pentane, Kr alcohol, Kr *n*-pentane and Xe *n*-pentane mixtures, are determined in dependency of the voltage on the counters.

10637 (English.) **Nuclear Spin Relaxation in Hydrogen. I. The Gas.** Myer Bloom. *Physica*, v. 23, Mar. 1957, p. 237-247.

Proton spin-lattice relaxation time was measured in H_2 as a function of density at 20.4 K, ortho-para concentration at 20.4 K, percentage H_2 molecules in H_2-He mixtures at 20.4 K, and density of the saturated vapor between 20.4 and 15.5 K.

10638 Correlations Between the Neutron Multiplicities and Spontaneous Fission Modes of Californium-252. Donald A. Hicks, John Isle, Jr., Robert V. Pyle, Gregory Choppin, and Bernard Harvey. *Physical Review*, v. 105, ser. 2, Mar. 1, 1957, p. 1507-1511.

The numbers of prompt neutrons associated with specific fission modes were measured.

10639 Electrodisintegration of Cu^{63} and Mn^{55}. R. L. Hines. *Physical Review*, v. 105, ser. 2, Mar. 1, 1957, p. 1534-1539.

Investigated for total electron energies from 29.5 to 81.5 m.e.v. by a stacked-foil experiment using the internal electron beam of a synchrotron.

10640 Pairing Effect in Nuclei. Y. F. Bow. *Physical Review*, v. 105, ser. 2, Mar. 1, 1957, p. 1541-1544.

Suggests that this effect may be fairly general in the region of medium-weight and heavy nuclides; however, several regions in which the effect is in the opposite direction have also been reported.

10641 Alpha-Particle Bombardment of Magnesium Isotopes. H. G. Graetzer and A. B. Robbins. *Physical Review*, v. 105, ser. 2, Mar. 1, 1957, p. 1570-1572.

10642 Parity Nonconservation and a Two-Component Theory of the Neutrino. T. D. Lee and C. N. Yang. *Physical Review*, v. 105, ser. 2, Mar. 1, 1957, p. 1671-1675.

Experimental implications are analyzed and some general remarks concerning nonconservation are made.

10643 Energy Levels in Electron-Bombarded Silicon. G. K. Wertheim. *Physical Review*, v. 105, ser. 2, Mar. 15, 1957, p. 1730-1735.

An electron trapping level is located 0.16 e.v. below the conduction band and a hole-trapping level 0.29 e.v. above the valence band.

10644 Range of 6- to 18-Mev Protons in Be, Al, Cu, Ag, and Au. H. Bichsel, R. F. Mozley, and W. A. Aron. *Physical Review*, v. 105, ser. 2, Mar. 15, 1957, p. 1788-1795.

10645 Low-Lying Levels in U^{238} Excited by Inelastic Neutron Scattering. Robert C. Allen. *Physical Review*, v. 105, ser. 2, Mar. 15, 1957, p. 1796-1798.

The first two excited states in U^{238} are at 50 ± 20 k.e.v. and 140 ± 25 k.e.v.

10646 *n-d* Scattering at 2.45 and 3.27 Mev. John D. Seagrave and Lawrence Cranberg. *Physical Review*, v. 105, ser. 2, Mar. 15, 1957, p. 1816-1820.

Complete angular distributions for the elastic scattering of neutrons by deuterons were obtained at 2.45 and 3.27 m.e.v. by direct observation of the scattered neutrons using a time-of-flight technique.

10647 Impact Zones for Solar Cosmic-Ray Particles. R. Lüst. *Physical Review*, v. 105, ser. 2, Mar. 15, 1957, p. 1827-1839.

Orbits for cosmic-ray particles starting from the vicinity of the sun and passing through the geomagnetic dipole field were integrated using the AVIDAC computer. Counting rates at the top of the atmosphere were calculated from the integrated orbits in order to make possible the analysis of cosmic-ray intensity increases during solar flares.

10648 Isobaric Nucleon Model for Pion Production in Nucleon-Nucleon Collisions. S. J. Lindenbaum and R. M. Sternheimer. *Physical Review*, v. 105, ser. 2, Mar. 15, 1957, p. 1874-1899.

10649 Theory of High-Energy Bremsstrahlung and Pair Production in a Screened Field. Haakon Olsen, L. C. Maximon, and Harald Wergeland. *Physical Review*, v. 106, ser. 2, Apr. 1, 1957, p. 27-46.

10650 Twenty-Parameter Eigenfunctions and Energy Values of the Ground States of He and He-Like Ions. J. F. Hart and G. Herzberg. *Physical Review*, v. 106, ser. 2, Apr. 1, 1957, p. 79-82.

10651 Radioactivity of Ti^{44}. J. R. Huizenga and J. Wing. *Physical Review*, v. 106, ser. 2, Apr. 1, 1957, p. 90-92.

A decay scheme is suggested in which Ti^{44} electron captures predominantly to a 144-kev level in Sc^{44} which in turn deexcites by two gamma rays in cascade. A Ti^{44} half-mile of approximately 10^3 years is deduced.

10652 Neutron Resonance in the kev Region: Odd-Intermediate Nuclei. Harvey Marshak and Henry W. Newson. *Physical Review*, v. 106, ser. 2, Apr. 1, 1957, p. 110-116.

10653 Optical-Model Analysis of the Elastic Scattering of Alpha Particles. G. Igo and R. M. Thaler. *Physical Review*, v. 106, ser. 2, Apr. 1, 1957, p. 126-133.

10654 Thermal Inelastic Scattering of Cold Neutrons in Polycrystalline Graphite. L. S. Kothari and K. S. Singwi. *Physical Review*, v. 106, ser. 2, Apr. 15, 1957, p. 230-234.

10655 Neutron-Transfer Reactions From the Nitrogen Bombardment of Be, C, O, Na, and $Mg^{24-25-26}$. M. L. Halbert, T. H. Handley, J. J. Pinajian, W. H. Webb, and A. Zucker. *Physical Review*, v. 106, ser. 2, Apr. 15, 1957, p. 251-256.

10656 Inelastic Scattering of 40.2-Mev Alpha Particles. G. Igo. *Physical Review*, v. 106, ser. 2, Apr. 15, 1957, p. 256-260.

Measurements of differential cross sections at 25, 45, 90, 135, and 150° for inelastic scattering of α particles from Al, V, Cu, Nb, Ag, Ta, and Th.

10657 Gamma Rays From the Proton Bombardment of N^{15}. S. Bashkin and R. R. Carlson. *Physical Review*, v. 106, ser. 2, Apr. 15, 1957, p. 261-266.

The yield of 4.43-m.e.v. γ-rays from the reaction N^{15} (p,α,γ) C^{12} was measured for proton energies between 800 and 4020 kev. A gas target, enriched to 61% in N^{15} was used. New resonances were observed at bombarding energies of 1985 ± 20 kev., 3000 ± 30 kev., 3300 ± 35 kev., 3350 ± 50 kev., and 3520 ± 40 kev., with widths of 25 ± 5 kev., 45 ± 10 kev., 75 ± 15 kev., 750 ± 100 kev., and 100 ± 25 kev., respectively.

10658 Direct Nuclear Reactions. S. T. Butler. *Physical Review*, v. 106, ser. 2, Apr. 15, 1957, p. 272-286.

It is contended that the large majority of nuclear reactions which proceed to a low-lying level of the final nucleus are predominantly direct reactions with stripping-like angular distributions.

10659 Photodisintegration of C^{13}. Barnett C. Cook. *Physical Review*, v. 106, ser. 2, Apr. 15, 1957, p. 300-314.

Neutron yield functions of C^{12} and C^{13} from bremsstrahlung up to 41 m.e.v. were measured by using direct neutron detection. The photoproton yield function for C^{13} was also measured by detecting the B^{12} activity. These yield functions were converted into cross sections by a slightly modified standard method.

10660 Analysis of Polarization in Neutron-Proton Scattering. Y. Takano and M. H. Hull, Jr. *Physical Review*, v. 106, ser. 2, Apr. 15, 1957, p. 321-326.

10661 Catalysis of Nuclear Reactions Between Hydrogen Isotopes by μ^- Mesons. J. D. Jackson. *Physical Review*, v. 106, ser. 2, Apr. 15, 1957, p. 330-339.

The mechanism of catalysis is discussed in detail.

10662 Fermi Decay of Higher Spin Particles. R. E. Behrends and C. Fronsdal. *Physical Review*, v. 106, ser. 2, Apr. 15, 1957, p. 345-353.

10663 Correlation Energy of an Electron Gas at High Density. Katuro Sawada. *Physical Review*, v. 106, ser. 2, Apr. 15, 1957, p. 372-383.

Correlation energy is successfully evaluated without using perturbation treatment.

10664* (English.) **A Cascade Shower in Nuclear Emulsions.** Senzo Tokunaga, Kiyoshi Nishikawa, and Taka Ishii. *Physical Society of Japan, Journal*, v. 12, Mar. 1957, p. 219-221.

Energy of a cascade was determined from its lateral distribution at successive stages of its development through several radiation lengths comparing with cascade theory.

10665 Thermonuclear Reaction Rates. W. B. Thompson. *Physical Society, Proceedings*, v. 70, no. 445B, Jan. 1957, p. 1-5.

The thermonuclear reaction rate between two gases in thermal equilibrium and of densities n_1 and n_2 nuclei per unit volume can be written as $n_1 n_2$ $[\sigma v]$ where $[\sigma v]$ is a suitable average of the product of the reaction cross section and relative velocity, and for any reaction is a function of temperature alone.

10666 Equilibrium Characteristics of a Pinched Gas Discharge Cooled by Bremsstrahlung Radiation. R. S. Pease. *Physical Society, Proceedings*, v. 70, no. 445B, Jan. 1957, p. 11-23.

10667 The Average Neutron Total Cross Sections of Heavy Elements at Low Energy. D. B. Gayther and K. P. Nicholson. *Physical Society, Proceedings*, v. 70, Jan. 1957, p. 51-61.

A method is developed for determining the total cross section averaged over many resonances of an element from a direct measurement of the average transmission of a thick sample.

10668 γ-Radiation Following Proton Capture in ^{35}Cl, ^{37}Cl and ^{39}K. J. H. Towle, R. Berenbaum, and J. H. Matthews. *Physical Society, Proceedings*, v. 70, Jan. 1957, p. 84-90.

The excitation functions of the reactions $Cl(p,\gamma)A$ and ^{39}K $(p,\gamma)^{40}Ca$ in the region 0.8-1.8 m.e.v. was obtained using targets of natural isotopic composition.

10669 Inelastic Collisions Between Heavy Particles. V. Electron Loss for Fast He+ Ions Passing Through Atomic Hydrogen, and Ionization of Hydrogen Atoms by Fast He+ Ions. VI. The $2s^3S$-$2p$ and $3p^3P$ Excitations of Fast He Atoms by H and Ne Atoms. J. Adler and B. L. Moiseiwitsch. *Physical Society, Proceedings*, v. 70, no. 446A, Feb. 1957, p. 110-122.

10670 An Emulsion Spectrograph—A New Technique for the Determination of the Momenta of Fast Charged Particles. I. Design Considerations and Theory. II. Construction and Applications of a Normal Incidence Stack. A. J. Apostolakis and I. Macpherson. *Physical Society, Proceedings*, v. 70, no. 446A, Feb. 1957, p. 146-164.

10671 The Multiple Scattering of Positrons and Electrons. C. Henderson and A. Scott. *Physical Society, Proceedings*, v. 70, no. 447A, Mar. 1957, p. 188-194.

Measurements with a scintillation counter show that pronounced deviations from the Molière theory do not occur.

10672 Protons From the Interaction of 14 MeV Neutrons With Medium Weight Nuclei. D. L. Allan. *Physical Society, Proceedings*, v. 70, no. 447A, Mar. 1957, p. 195-208.

Energies of the protons emitted by Al^{27}, Fe^{54}, Fe^{56}, Ni^{58}, Ni^{60}, and Cu^{63} when bombarded by 14 m.e.v. neutrons were determined using a photographic plate method.

10673 Magnetic Analysis of Tritons and Alpha Particles Emitted From the Deuteron Bombardment of Teflon. F. A. El Bedewi and I. Hussein. *Physical Society, Proceedings*, v. 70, no. 448A, Apr. 1957, p. 233-240.

10674 Light Output of Potassium Iodide Crystals Under Bombardment by Carbon Ions. W. E. Burcham. *Physical Society, Proceedings*, v. 70, no. 448A, Apr. 1957, p. 309-313.

10675 Progress in Nuclear Energy. Series V. Metallurgy and Fuels. H. M. Finniston and J. P. Howe, editors. v. I. 805 p. 1956. Pergamon Press Ltd., London. (QC775 P94n)

Production, preparation, properties, and metallurgy of U, Th, Be, Zr, Pu, and the rare metals. Preparation, properties, and use of ceramics in reactors. Fuel elements; effects of irradiation; solid state physics.

10676* **Calculations of Energy Dissipation Characteristics in Water for Various Radiations.** P. R. J. Burch. *Radiation Research*, v. 6, Mar. 1957, p. 289-301.

Calculations are given for 25-Mvp betratron X, Co^{60} γ, 220-kvp primary X, 200-kvp total X, 100-kvp primary X, tritium β, plutonium α, and 1-m.e.v. α radiations.

10677 Radiation Safety and Major Activities in the Atomic Energy Programs. 396 p. 1957. Available from Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. (UF767 Un3.1ra)

Describes A.E.C. activities for the period July-Dec. 1956.

10678 Total Absorption Čerenkov Counter. W. B. Jones, H. R. Kratz, and J. Rouvina. *Review of Scientific Instruments*, v. 28, Mar. 1957, p. 167-175.

Counter detects and measures the energy of X-rays in the 50 to 300 m.e.v. range.

10679 Medium-Energy Neutron Time-of-Flight Spectrometer. R. Grismore and W. C. Parkinson. *Review of Scientific Instruments*, v. 28, Apr. 1957, p. 245-253.

Instrument developed for the 1- to 20-m.e.v. region makes use of the phase bunching of deuterons in the Michigan 42-in. cyclotron and an external beam pulsing system to provide isolated bursts of neutrons of 4-mμ. sec. time duration.

10680 Electromagnetic Structure of Nucleons. D. R. Yennie, M. M. Lévy, and D. G. Ravenhall. *Reviews of Modern Physics*, v. 29, Jan. 1957, p. 144-157.

Theoretical implications of various experiments relating to the electromagnetic structure of nucleons are examined in the light of current field theory. It is concluded either that the nucleon core is about three times as large as would be expected from intuitive considerations of meson theory, or that there is some inconsistency in the present field theory.

10681 Fall of Parity. Recent Discoveries Related to Symmetry Laws of Nature. L. S. Rodberg and V. F. Weisskopf. *Science*, v. 125, Apr. 5, 1957, p. 627-633.

Several experiments in nuclear physics contradict the principle of parity.

10682 Study of the Feasibility of Aqueous Recovery of Spent Fuels. III. Calculated Distribution of Fission Product Nuclides. John V. Nehemias, Ralph C. Dennis, and Eugene Ambo. *University of Michigan (U. S. Atomic Energy Commission)*, AECU-3044, June 1954, 140 p. (UF767 U3au Contin.)

10683 Resonance Capture in Heterogeneous Systems. Stanley Stein. *Westinghouse Electric Corporation, Atomic Power Division (U. S. Atomic Energy Commission)*, WAPD-139, Nov. 1955, 27 p. (UF767 Un3.1wa Contin.)

A model is described for the calculation of resonance escape probabilities in a variety of water-moderated reactor lattices.

See also: **9456** (irradiation facilities); **9539** (chemical processing of fuel elements); **9599** (nuclear methods in chemical analysis); **9769** (properties of polyphenyls); **9871** (vapor pressure studies in light and heavy waters); **9951** (reactor similator); **10090** (electronic transformer applications); **10272** (pumps for liquid metals); **10315** (U-Al alloy fuel elements); **10460** (liquid-metal-coolant properties); **10582** (nondestructive testing of fuel elements).

OPERATIONS RESEARCH AND MANAGEMENT ENGINEERING

10684* The Administrative Processes of Contract and Grant Research. Alan C. Rankin. *Administrative Science Quarterly*, v. 1, Dec. 1956, p. 275-294.

The specific processes involved in contract research administration are those of determining areas of research interest, evaluating and selecting proposals for support, negotiating and supervising research projects, and evaluating results.

10685* Administration of Research in a Research Corporation. John L. Kennedy and G. H. Putt. *Administrative Science Quarterly*, v. 1, Dec. 1956, p. 326-339.

Considers the problem of communication between research administrators and researchers.

10686 The Administrator. Cases on Human Relations in Business. John Desmond Glover and Ralph M. Hower. 3rd Ed. 803 p. 1957. Richard D. Irwin, Homewood, Ill. (HF5549 G51a)

A collection of "real life" cases used in teaching a course in business administration.

10687 Human Engineering. Lawrence J. Fogel. *Aviation Research and Development*, v. 2, Apr. 1957, p. 16-17.

Human engineering knowledge is derived from three of the classical sciences—mathematics, psychology, and biology. A chart shows these interrelationships as applied to design of an aircraft cockpit.

10688 Linear Programming as a Tool for the Solution of Management Problems. A. Charnes and W. W. Cooper. *Chemical Engineering Progress*, v. 53, Apr. 1957, p. 170-173.

Method for solving complex problems involving many variables is demonstrated, using factory example.

10689 Management of Large R & D Organizations. Nathan I. Hall. *I.R.E., Proceedings*, v. 45, Apr. 1957, p. 451-454.

Stresses the importance of building a high caliber scientific staff and then providing it with interesting research and development projects in the midst of a pleasant professional environment. Organization, management techniques, and qualities of leadership are considered.

10690 Introduction to Operations Research. C. West Churchman, Russell L. Ackoff, and E. Leonard Arnoff. 645 p. 1957. John Wiley & Sons, New York. (HD20 C47i)

Basic coverage of principles and methods, illustrated by case examples from business and industry.

10691 Laboratory Administration. E. S. Hiscocks. 392 p. 1956. MacMillan & Co., London. (Q183 H62L)

Recommendations addressed to scientists who, as their careers progress, become responsible for the supervision of the work of others and are thus introduced to the art or science of management.

10692 Selection and Training of Foremen in Europe. Sven Grabe and Paul Silberer. 172 p. 1956. Organization for European Economic Co-operation, Paris. (HF5549 G75s)

Teaching methods and aids; selection criteria and methods.

See also: **10118** (production management).

ORE AND MATERIALS BENEFICIATION

10693* (German.) Results of Studies on Flotation Improvement and Applicability in Service. **Forschungsergebnisse über die Verbesserung der Flotation und ihre Anwendbarkeit im Betrieb.** Pierre Belugou. *Glückauf*, v. 93, Mar. 16, 1957, p. 313-321.

Many liquid pulps of different origins showed that the grain distribution and the weight distribution could be very different. Flotation curves corresponding to the rough and to the fine separation were applied to a few examples. The causes and effectiveness of flotation are examined and several improvements are offered.

10694 Uranium Recovery From Wet Process Phosphoric Acid. Bruce F. Greek, Otis W. Allen, and Donald E. Tynan. *Industrial and Engineering Chemistry*, v. 49, Apr. 1957, p. 628-638.

Recovery plant uses a pyrophosphate ester in a kerosine diluent to extract U as a complex from H_3PO_4 solution. Mixed HF and H_2SO_4 break the complex, precipitating the complex salt $UF_4 \cdot XHF$.

10695 Selective Sulfation for Cadmium Recovery at Josephtown Smelter. R. E. Lund and D. E. Warnes. *Journal of Metals*, v. 9, sec. 1; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, Apr. 1957, p. 608-611.

Investigation of the autogentic sulfation of CdO by $ZnSO_4$ disclosed the existence of a sulfation series in which sulfates higher in the series will, upon heat treatment of a mixture, sulfate oxides of metals lower in the series.

10696* (Hungarian.) Chemical Concentration of Manganese Carbonate Ore. **Karbonátos mangánére vegyi dúsítása.** Sándor Dunay. *Kohászati Lapok*, v. 11, Nov.-Dec. 1956, p. 514-517.

Investigation of Hungarian ore, its dissolution, and precipitation of the manganese carbonate.

10697 The Resin-in-Pulp Method for Recovery of Uranium. R. F. Hollis and C. K. McArthur. *Mining Engineering*, v. 9, Apr. 1957, p. 442-449.

Dissolved U is recovered from acid-leached pulps by strong base anion exchange resins. Processing details and advantages are outlined.

10698* The Development of the Acid Leaching Process for the Extraction and Recovery of Uranium From Rand Cyanide Residues. P. A. Laxen and M. G. Atmore. *South African Institute of Mining and Metallurgy, Journal*, v. 57, Jan. 1957, p. 359-375.

10699* The History of the Development of the Ion Exchange Process as Applied to Uranium Extraction. R. E. Robinson and R. G. Velthuis. *South African Institute of Mining and Metallurgy, Journal*, v. 57, Jan. 1957, p. 376-385.

10700* (Russian.) Effects of Composition of Aliphatic Amines on Flotation Activity. **O sostave alifaticheskikh aminov i ikh flotatsionnom deistvii.** A. K. Livshits and K. M. Madiev. *Tsvetnye Metally*, v. 30, Mar. 1957, p. 5-8.

Flotation of quartz and smithsonite by pure octadecylamine and methylocta-decylamine and industrial amines derived from synthetic aliphatic acids. Yield of quartz and smithonite in relation to the pH of the pulp and the amount of collector used.

10701 Percolation Leaching of Manganese Ores With Sulfur Dioxide. F. N. Bender and Carl Rampacek. *U. S. Bureau of Mines, Report of Investigations* 5323, Mar. 1957, 20 p. (TN21 Un3r)

Demonstrates the technical feasibility of treating roasted wad-type ores and unroasted granular ores by the percolation procedure, either in vats or in heaps.

10702 Flotation of Iron Sulfides From Zinc Tailings of South-Western Wisconsin Lead-Zinc District. T. A. Evans, Jr., J. W. Pennington, and P. A. Wasson. *U. S. Bureau of Mines, Report of Investigations* 5324, Mar. 1957, 9 p. (TN21 Un3r)

Concentrates produced ranged between 40 and 47% S. Removal of a Zn scavenger concentrate was necessary.

See also: **9555** (extraction of $Zr(NO_3)_4$); **10836** (cleaning of waste gases).

PHYSICS

10703 Absorption of Sound by Patches of Absorbent Materials. Richard K. Cook. *Acoustical Society of America, Journal*, v. 29, Mar. 1957, p. 324-329.

Exact solutions are found for the absorption of perpendicularly incident plane waves, and of randomly incident waves, on a circular piston-like absorber, also on an infinitely long strip-piston absorber.

10704 Reflection of Plane Sound Waves From a Sinusoidal Surface. John G. Parker. *Acoustical Society of America, Journal*, v. 29, Mar. 1957, p. 377-380.

10705* Thermal Relaxation in Carbon Dioxide as a Function of Temperature. F. Douglas Shields. *Acoustical Society of America, Journal*, v. 29, Apr. 1957, p. 450-454.

10706* (German.) New Results on Electron Emission in Non-Ferrous Metals. **Neue Ergebnisse über Exoelektronenemission an Nichtmetallen.** G. Gourgé and W. Hanle. *Acta Physica Austriaca*, v. 10, no. 4, 1957, p. 427-447.

The fading of electron emission and of luminescence in $CaSO_4/Mn$ is hyperbolic. Effect of annealing on intensity and fading. Thermal and optic stimulation of the electron emission.

10707* (English.) **Microstructure of Photoconductive Lead Sulphide Layers.** A. Feltynowski, I. Glass, T. Piwkowski, and A. Toruń. *Acta Physica Polonica*, v. 15, no. 5, 1956, p. 275-282 + 7 plates.

In general, the PbS layers consist of crystals 200 to 300 A in size. Diffraction patterns of layers deposited directly by evaporation correspond to a regular face-centered lattice of the NaCl type .

10708* **American Institute of Physics Handbook.** Sections individually paged. 1957. McGraw-Hill, New York. (QC21 Am35p Ref.)

An authoritative and comprehensive reference work containing data relating to mathematics, mechanics, heat, sound, electricity and magnetism, optics, and atomic, molecular, and nuclear physics.

10709 Lagrangian Formulation and Mechanical Interpretation. Mario Bunge. *American Journal of Physics*, v. 25, Apr. 1957, p. 211-218.

An analysis of physical theories, with special emphasis on classical mechanics, electromagnetism, and quantum mechanics. It is concluded that Lagrangian formulations contribute to the demechanization of physics and that the program of reduction to mechanics has not succeeded in physics.

10710 Unified Treatment of the Vibrating Arm. II. The Solution When the Restoring Force Is Positive and Also When It Is Expressed as a Power Series in ψ. Dan McLachlan, Jr. *American Journal of Physics*, v. 25, Apr. 1957, p. 228-248.

10711 Vector Resultants Obtained Graphically Through Centroids. S. I. Askovitz. *American Journal of Physics*, v. 25, Apr. 1957, p. 254-256.

A simple method whereby the resultant of a set of vectors in a plane may be determined or checked by locating the centroid of the starting points of the vectors and the centroid of their endpoints.

10712 The First Law of Thermodynamics for a Continuous Medium in Mass Motion. Lawrence M. Grossman. *American Journal of Physics*, v. 25, Apr. 1957, p. 257-261.

The integral form of the conservation of energy for a continuous medium in motion is derived from the usual differential expression of the first law of thermodynamics. Various special cases of this relation are considered.

10713* On the Diffraction of Sound Waves in a Viscous Medium. J. B. Alblas. *Applied Scientific Research*, v. 6, sec. A, no. 4, 1957, p. 237-262.

The two-dimensional diffraction problem of a half-plane barrier is analyzed.

10714 Measurement of Dielectric and Magnetic Properties of Ferromagnetic Materials at Microwave Frequencies. Wilhelm von Aulock and John H. Rowen. *Bell System Technical Journal*, v. 36, Mar. 1957, p. 427-448.

Techniques which permit measurement of properties in the microwave region by observing the perturbation in a cylindrical cavity due to insertion of a small ferrite sample.

10715 The Gravitational Fields of Electric and Magnetic Dipoles. Gerald E. Tauber. *Canadian Journal of Physics*, v. 35, Apr. 1957, p. 477-482.

Einstein's field equations are solved for cylindrical symmetry in the presence of electric and magnetic singularities (dipoles).

10716* (French.) Basis of the Kinetic Theory. Evolution and Irreversibility of Systems. **Base de la théorie cinétique. Evolution et irréversibilité des systèmes.** Simone Marquet. *Comptes Rendus*, v. 244, Mar. 11, 1957, p. 1463-1466.

A system of corpuscules is described by a determination of the special characteristics of their velocities. The fundamental equation confirming this measurement is solved. The solutions are studied from the viewpoint of their evolution in time and their asymptotic behavior.

10717* (French.) A Spectroscopic Study of Spark Discharges in Compressed Gases. **Étude spectroscopique des étincelles glissantes dans les gaz comprimés.** Yvonne Leycuras and Roger Aumont. *Comptes Rendus*, v. 244, Apr. 1, 1957, p. 1910-1912.

The spectra of H, He, and N were studied. The emission was influenced by the material used as a carrier. The nature of the spectrum was determined by the intensity of the discharges, giving a molecular or an atomic spectrum.

10718* (German.) Finite Difference Method for Calculating Transient Temperature Distributions Due to One-Dimensional Heat Flow in Simple and Composite Bodies. **Differenzenverfahren zum Berechnen von Temperatur-Ausgleichsvorgängen bei eindimensionaler Wärmeströmung in einfachen und zusammengesetzten Körpern.** Herbert Schuh. *Forschung auf dem Gabiete des Ingenieurwesens*, v. 23, Ausgabe B, *VDI Forschungsheft* 459, 1957, 43 p.

10719 Heat and Thermodynamics. An Intermediate Textbook for Students of Physics, Chemistry and Engineering. Mark W. Zemansky. 4th Ed. 484 p. 1957. McGraw-Hill, New York. (QC254 Z4h4)

Fundamental ideas of temperature, work, internal energy, heat, reversibility, and entropy, with examples and applications to ideal gases. Detailed physical, chemical, and engineering applications. Methods of measurement.

10720* Heat Transfer—A Bibliography of Unclassified Report Literature. James M. Jacobs and Gifford A. Young, compilers. 169 p. 1957. Available from Office of Technical Services, Department of Commerce, Washington, D. C. (ZQC 320 Un3.1h Ref.)

Includes 1029 annotated references.

10721* Faraday Effect in Cubic Crystals. V. Sivaramakrishnan. *Indian Institute of Science, Journal*, v. 39, sec. A, Jan. 1957, p. 1-7.

The magneto-optic rotation was measured in crystals of KCl, KBr, KI, LiF, and MgO for a number of wavelengths from γ 5780 A to λ 2848 A. Dispersion formulas are proposed for both optical refraction and magnetic gyration.

10722* The Thermo-Optic Behaviour of Calcium Fluoride, Ammonium Chloride and Zinc-Blende at Low Temperatures. C. P. Gopalakrishnan. *Indian Institute of Science, Journal*, v. 39, sec. A, Jan. 1957, p. 8-12.

Values of the proportionate shift with temperature of the ultra-violet dispersion frequencies were calculated.

10723 Studies in Nonequilibrium Rate Processes. I. The Relaxation of a System of Harmonic Oscillators. Elliott W. Montroll and Kurt E. Shuler. *Journal of Chemical Physics*, v. 26, Mar. 1957, p. 454-464.

10724 Effects of Pressure on Ultrasonic Relaxation in Liquids. T. A. Litovitz, E. H. Carnevale, and P. A. Kendall. *Journal of Chemical Physics*, v. 26, Mar. 1957, p. 465-468.

Data from experiments with glycerol and CS_2 are in accord with the view that thermal relaxation is the cause of compressional loss in nonassociated liquids and that structural relaxation is the predominant factor in associated liquids.

10725 Theoretical Investigations on the Light Scattering of Colloidal Spheres. I. The Specific Turbidity. Wilfried Heller and William J. Pangonis. *Journal of Chemical Physics*, v. 26, Mar. 1957, p. 498-506.

10726 Experiments on the Polarization and Decay of Electrets. G. G. Wiseman and G. R. Feaster. *Journal of Chemical Physics*, v. 26, Mar. 1957, p. 521-527.

The persistent volume polarization of a number of dielectrics can be expressed by analytical functions which are linear in the applied field and exponential in time. A major cause of electret decay is shown to be the self-depolarization of the electret by its own electric field.

10727 Mechanism of Conduction in Li-Substituted Transition Metal Oxides. R. R. Heikes and W. D. Johnston. *Journal of Chemical Physics*, v. 26, Mar. 1957, p. 582-587.

10728 Energy States and Luminescent Processes in the ZnF_2:Mn-Phosphor. Peter D. Johnson and Floyd L. Hughes. *Journal of Chemical Physics*, v. 26, Mar. 1957, p. 612-617.

With the aid of optical absorption, thermoluminescent, phosphorescent characteristics, and other properties, the mechanisms of trapping, untrapping, fluorescent excitation, and phosphorescence are clarified.

10729 Effects of Atomic Quadrupole Moments Upon the Index of Refraction. Robert A. Satten. *Journal of Chemical Physics*, v. 26, Apr. 1957, p. 766-772.

In order to obtain a dispersion formula a quantum mechanical calculation is made of the induced electric and magnetic dipole and electric quadrupole moments.

10730 Equation of State of Water to 250 Kilobars. Melvin H. Rice and John M. Walsh. *Journal of Chemical Physics*, v. 26, Apr. 1957, p. 824-830.

Equation applicable in the pressure range 25 to 250 kilobars is formulated in terms of experimental data obtained from shock wave measurements and used to calculate P-V relations for several adiabats and isotherms. Thermodynamic and hydrodynamic data along the Hugoniot curve are given as a function of shock pressure, and pressure-particle velocity relations for initial shocks followed by reflected shocks and rarefactions are given.

10731 Recognition and Classification of Semiconducting Compounds With Tetrahedral sp^3 Bonds. E. Mooser and W. B. Pearson. *Journal of Chemical Physics*, v. 26, Apr. 1957, p. 893-899.

10732 Modifications of the Cs Absorption Spectrum Due to Interatomic Interactions. Oleg Jefimenko and Shang-Yi Ch'en. *Journal of Chemical Physics*, v. 26, Apr. 1957, p. 913-919.

10733* A New Effort to Measure the Velocity of Light. Reinhold Gerharz. *Journal of Electronics*, v. 2, ser. 1, Mar. 1957, p. 416-424.

Apparatus uses a light pulse which originates from the dynodes of an electron multiplier as visible fluorescence radiation emitted by a crystallized surface (MgO) under electron excitation.

10734* (French.) Using Pseudo-Tensors in Physics. **Sur l'utilisation des pseudo-tenseurs en physique.** Théodore Vogel. *Journal de Physique et le Radium*, v. 18, Feb. 1957, p. 81-84.

Most of the difficulties raised by the relationships between the elements representing physical magnitudes disappear if pseudo-tensors are abandoned. Absolute tensor calculation, which is simpler than vector calculation, enables resolution of most problems of mathematical physics.

10735* (French.) Optical Constants of Thin Layers of Silver. **Constantes optiques de l'argent en couches minces.** R. Philip and J. Trompette. *Journal de Physique et le Radium*, v. 18, Feb. 1957, p. 92-98.

The methode of Malé was used to determine the thickness, index of refraction, and index of extinction of very thin layers of Ag in visible and near ultra-violet fields, especially in proximity to the transparency band of Ag (3,100 Å). Various theories were verified.

10736* (French.) Re-Sensitization of Selenium Photocells at Low Temperatures Through the Action of Near Infra-Red. **La resensibilisation, aux basses températures, des photopiles au sélénium par l'action du proche infra-rouge.** G. Blet. *Journal de Physique et le Radium*, v. 18, Feb. 1957, p. 121-127.

Parameters rendering the phenomenon possible were studied. The process was effective from 0.6 μ to 0.9 μ.

10737 Molecular Spectroscopy. George Sell, editor. 234 p. 1955. Institute of Petroleum, London. (QC463.H9 In7m)

Twenty papers on instrumentation, techniques, and applications of various types of spectroscopy.

10738 Vibrational Analysis of the Molecular Spectra of Polonium. G. W. Charles, D. L. Timma, D. J. Junt, and G. Pish. *Optical Society of America, Journal*, v. 47, Apr. 1957, p. 291-296.

10739 Isotope Shift in the Spectrum of Mercury. Fred McClung and John R. Holmes. *Optical Society of America, Journal*, v. 47, Apr. 1957, p. 297-299.

By using separated isotopes of Hg-198 and Hg-202 in sealed discharge tubes, the isotope shift in several lines from 16,000 to 4,000 A was measured with direct recording techniques.

10740 (English.) **Controlled Crystal Anisotropy and Controlled Temperature Dependence of the Permeability and Elasticity of Various Cobalt-Substituted Ferrites** C. M. van der Burgt. *Philips Research Reports*, v. 12, Apr. 1957, p. 97-122.

10741 Ferroxcube Material for Piezomagnetic Vibrators. C. M. van der Burgt. *Philips Technical Review*, v. 18, no. 10, 1956/57, p. 285-298.

Specially prepared types of ceramic ferroxcube have proved in many respects to be as good as, and in some respects even superior to the piezomagnetic metals and alloys hitherto used. Ferroxcube vibrators can be used not only for generating and detecting acoustic waves, but also as temperature-independent elements in electric band-pass filters.

10742 Physical Properties of Crystals. Their Representation by Tensors and Matrices. J. F. Nye. 322 p. 1957. Oxford University Press, London. (QD931 N98p)

Tensor properties are considered in terms of their common mathematical basis and the thermodynamic relations between them.

10743 De-Excitation of ZnS and ZnCdS Phosphors by Electric Fields. Hartmut Kallmann and Peter Mark. *Physical Review*, v. 105, ser. 2, Mar. 1, 1957, p. 1445-1450.

Influence of strong a.c. and d.c. fields applied during the decay of photoconductivity of ZnS and ZnCdS phosphors is described.

10744 Effect of the Interaction Between Magnetic Particles on the Critical Single-Domain Size. A. H. Morrish and L. A. K. Watt. *Physical Review*, v. 105, ser. 2, Mar. 1, 1957, p. 1476-1478.

10745 Electrical and Optical Properties of Heat-Treated Silicon. W. Kaiser. *Physical Review*, v. 105, ser. 2, Mar. 15, 1957, p. 1751-1756.

Single crystals of Si exhibit optical scattering between 1 and 3μ after a heat treatment at 1000 C. The Tyndall effect was observed in such samples by using an infra-red image tube.

10746 Ground-State Energy of a Hard-Sphere Gas. F. J. Dyson. *Physical Review*, v. 106, ser. 2, Apr. 1, 1957, p. 20-26.

Rigorous lower and upper bounds are established for the energy of the ground state of a Bose gas with hard-sphere interaction between particles.

10747 Exchange and Superexchange Coupling Between Conduction Electrons and *d* Electrons in Magnetic Materials. G. W. Pratt, Jr. *Physical Review*, v. 106, ser. 2, Apr. 1, 1957, p. 53-66.

10748 Thermodynamic Properties of Liquid Helium Three. Vapor Pressures Below 1°K. Stephen G. Sydoriak and Thomas R. Roberts. *Physical Review*, v. 106, ser. 2, Apr. 15, 1957, p. 175-182.

10749 Ionic Drift Velocities and Electron Attachment Coefficients in Oxygen. D. S. Burch and R. Geballe. *Physical Review*, v. 106, ser. 2, Apr. 15, 1957, p. 183-187.

Transient ion currents following an initiating electron pulse were studied. Analysis of oscillographic records yields information regarding ionic drift velocities and the electron attachment coefficient.

10750 Study of Superconducting Hg by Nuclear Magnetic Resonance Techniques. F. Reif. *Physical Review*, v. 106, ser. 2, Apr. 15, 1957, p. 208-220.

10751* (English.) **Layer Structures of Magnetic Oxides.** Shuichi Iida. *Physical Society of Japan, Journal*, v. 12, Mar. 1957, p. 222-233.

10752* (English.) **Anisotropy in Polarized Barium Titanate Ceramics.** Masakazu Marutake and Takuro Ikeda. *Physical Society of Japan, Journal*, v. 12, Mar. 1957, p. 233-240.

Dielectric constants and elastic compliance coefficients of unpolarized and fully prepolarized $BaTiO_3$ ceramics are compared. The 180° reversals of domains mainly remain after the polarizing process. Anisotropy is small and is due to the piezoelectric interactions among single crystals.

10753* (English.) **Theory of the Ultrasonic Absorption in Aqueous Solutions. II. Aqueous Solutions of Some Alcohols.** Otohiko Nomoto. *Physical Society of Japan, Journal,* v. 12, Mar. 1957, p. 300-307.

Anomalous parts of the ultrasonic absorption coefficient were calculated for aqueous solutions of methanol, ethanol, and n-propanol as functions of the concentration.

10754 Homopolar Effects in Crystals Having the Sodium Chloride Type of Lattice. T. B. Grimley. *Physical Society, Proceedings,* v. 70, no. 446A, Feb. 1957, p. 123-133.

While homopolar effects provide an additional source of attraction between nearest (unlike) neighbors, they enhance the repulsion between like neighbors. The homopolar effect of LiF is only about 0.1% of th lattice energy.

10755 A Variational Method for the Calculation of Particle Densities and Sums of Eigenvalues in Wave Mechanics. N. H. March. *Physical Society, Proceedings,* v. 70, no. 447A, Mar. 1957, p. 169-175.

10756 The K Auger Yield for Tin. J. A. V. Fairbrother, D. G. Parkyn, and B. M. O'Connor. *Physical Society, Proceedings,* v. 70, no. 448A, Apr. 1957, p. 262-274.

Preliminary measurements, using Burhop's probability values for the possible Auger transitions, give 0.164 ± 8% as the K Auger yield for tin or 0.836 ± 1.5% for the fluorescent yield.

10757 The Magnetic Energy Levels of Electrons in Metals. A. D. Brailsford. *Physical Society, Proceedings,* v. 70, no. 448A, Apr. 1957, p. 275-287.

The magnetic energy levels of an electron in a periodic lattice are found using a generalization of the energy band of the simple cubic lattice.

10758 The Interaction of Electrons With Lattice Vibrations. P. G. Harper. *Physical Society, Proceedings,* v. 70, no. 448B, Apr. 1957, p. 390-392.

Simultaneous equations are derived for the frequency and zero-point energy of normal modes of lattice motion resulting from the electron-lattice interaction.

10759 Relaxation Processes and Inertial Effects. I. Free Rotation About a Fixed Axis. II. Free Rotation in Space. R. A. Sack. *Physical Society, Proceedings,* v. 70, no. 448B, Apr. 1957, p. 402-426.

10760 A Method for Determining the Nuclear Relaxation Mechanism in Crystals. E. R. Andrew and K. M. Swanson. *Physical Society, Proceedings,* v. 70, no. 448B, Apr. 1957, p. 436-440.

10761 Transient Effects in the Ionic Conductance of Anodic-Oxide Films at High Fields. J. F. Dewald. *Physics and Chemistry of Solids,* v. 2, Mar. 1957, p. 55-66.

Data on the transient response of the ionic conductance of Ta_2O_5 films to abrupt changes in current.

10762* (English.) **Determination of the Surface Tension at 20 C of Mineral Oil Fractions From Their Ultrasonic Sound Velocity and Density Both Measured at 20°C.** J. Cornelissen and H. I. Waterman. *Recueil des Travaux Chimiques des Pays-Bas,* v. 76, Jan. 1957, p. 101-108.

10763 Broadening and Shift of Spectral Lines Due to the Presence of Foreign Gases. Shang-Yi Ch-en and Makoto Takeo. *Reviews of Modern Physics,* v. 29, Jan. 1957, p. 20-73.

A review article covering both theory and experiments dealing with pressure effects due to neutral particles.

10764 Description of States in Quantum Mechanics by Density Matrix and Operator Techniques. U. Fano. *Reviews of Modern Physics,* v. 29, Jan. 1957, p. 74-93.

10765 Rapid Measurement of Thermal Conductivity by Transient Heating of a Fine Thermo-Junction. R. A. W. Hill. *Royal Society, Proceedings,* v. 239, ser. A, Apr. 9, 1957, p. 476-486.

10766 Thermodynamics and Statistical Mechanics. A. H. Wilson. 495 p. 1957. Cambridge University Press, London. (QC311 W69t)

Classical and axiomatic development of thermodynamics; fundamental principles of statistical mechanics; applications to a wide variety of problems.

10767 The Influence of Gas Dissociation on Heat Transfer. John L. Beal and Ray L. Lyerly. *Wright Air Development Center, WADC Technical Report* 56-494, 1956, 43 p. (TL507 Un3.18w Vis.)

The heat transfer coefficients measured in the N_2O_4-NO_2 dissociating system are up to eight times larger than would be anticipated with a non-dissociating gas. This is roughly in proportion to the increase in specific heat.

10768* (English.) **A Note on the Cooperative Diffusion of Vacancies and Impurity Atoms.** Howard Reiss. *Zeitschrift für Elektrochemie,* v. 61, no. 1, 1957, p. 79-82.

Formal solution of a boundary value problem involving the simultaneous diffusion of lattice vacancies and impurities.

10769* (German.) Effect of Hydrogen on the Electrical Conductivity of Zinc Oxide Crystal Surfaces. **Zum Einfluss von Wasserstoff auf die elektrische Leitfähigkeit an der Oberfläche von Zinkoxydkristallen.** G. Heiland. *Zeitschrift für Physik,* v. 148, no. 1, 1957, p. 15-27.

Preparation of single crystals. Effect of O and H on electrical conductivity. Effect of crystal properties on surface conductivity. Use of ZnO as a detector of atomic H.

See also: **9541** (heat transfer); **9870** (thermoluminescence of alkali halides); **9963** (principles of magnetism); **10104** (design of magnets); **10130** (cyclic-temperature heat transfer coefficients); **10279** (design of permanent magnet assemblies); **10481** (nuclear magnetic resonance in metals); **10863** (producing temperature below −100 C).

PLASTICS

10770 Crystallizable Polystyrene. I. Polymerization of Styrene With Alfin Catalysts. Jack L. R. Williams, John VanDerBerghe, Kenneth R. Dunham, and William J. Dulmage. *American Chemical Society, Journal,* v. 79, Apr. 5, 1957, p. 1716-1720.

Describes an amorphous polymer which can be heated in a suitable crystallizing medium to produce crystalline polystyrene.

10771 Analytical Studies on the Aging of Isocyanate-Based Foams. Jeanne K. Buxbaum. *Analytical Chemistry,* v. 29, Apr. 1957, pt. 1, p. 492-496.

Polyester urethane foams undergo changes during natural aging which stem from hydrolysis of the foam to form solvent-soluble polymer fragments, an insoluble residue CO_2 and amine end groups. Aging can be followed by extraction studies and color tests for the amine end groups.

10772* (German.) Kinetics of Stereospecific Polymerization of Propylene to Isotactic Polymers. **Kinetik der stereospezifischen Polymerisation des Propylens zu isotaktischen Polymeren.** G. Natta, I. Pasquon, and E. Giachetti. *Angewandte Chemie,* v. 69, Apr. 7, 1957, p. 213-219.

10773* (English.) **A Thermistor Method for the Determination of Velocity Coefficients of Vinyl Polymerization. IV.** Hajime Miyama. *Chemical Society of Japan, Bulletin,* v. 30, Jan. 1957, p. 10-13.

10774 Epoxide Resins. Some Aspects of the Use of Glass Fibres for the Reinforcement of Epoxy Resins. K. J. Brookfield. *Chemistry & Industry,* no. 15, Apr. 13, 1957, p. 438-443.

Production of glass fibers; glass compositions and surface characteristics; keying agents; constructional applications in combination with epoxy resins.

10775* (Russian.) Polymerization of Unsaturated Organo-Germanium Compounds. **Polimerizatsiia nepredel'nykh germaniiorganicheskikh soedinenii.** V. V. Korshak, A. M. Moliakova, A. D. Petrov, and V. F. Mironov. *Doklady Akademii Nauk SSSR,* v. 112, Jan. 21, 1957, p. 436-438.

Polymerization capacity of di- and triallylgermanium and their copolymerization with methylmethacrylate.

10776* (Russian.) Polymerization in Viscous Media. **O polimerizatsii v viazkikh sredakh.** I. A. Arbuzova, V. N. Efremova, and I. K. Ulezlo. *Doklady Akademii Nauk SSSR,* v. 112, Feb. 1, 1957, p. 645-648.

Discusses problems of polymerization of acrylamide, methacrylamide, and methylolmethacrylamide in glycerin.

10777* Polymerization of Styrene Under Effect of Diazoamine Compounds and Activators. **Polimerizatsiia stirola pod vliianiem diazoaminosoedinenii i aktivatorov.** P. A. Vinogradov. *Doklady Akademii Nauk SSSR*, v. 112, Feb. 11, 1957, p. 860-863.

Experimental investigation of the effect of organic acids and their anhydrides on the polymerization rate of styrene with 2% of diazoaminobenzene. The latter accelerates the process of polymerization of styrene in the condensed phase. This phenomenon is a property of all acids soluble in hydrocarbons. The same effect was observed during polymerization of O,0′-dimethyl-diasoaminobenzene and n,n′-dimethyldiazoaminobenzene.

10778 The Polymerization of Acrylamide in Aqueous Solution. I. The X- and γ-Ray Initiated Reaction. II. The Effect of Ferric Perchlorate on the X- and γ-Ray Initiated Reaction. E. Collinson, F. S. Dainton, and G. S. McNaughton. **III. The Hydrogen Peroxide Photosensitized Reaction at 25°C.** F. S. Dainton and M. Tordoff. *Faraday Society, Transactions*, v. 53, Apr. 1957, p. 476-511.

10779* (German.) Radiographic Investigations on Water-Free and Water-Containing Alkylpolyethylenoxides. **Röntgenographische Untersuchungen an wasserfreien und wasserhaltigen Alkylpolyäthylenoxyden. I.** Literature Review. **Literaturübersicht.** M. Kehren and M. Rösch. *Fette, Seifen, Anstrichmittel*, v. 59, Jan. 1957, p. 1-8.

Investigations on washing agents and their solutions and on alkylpolyethylenoxides of myricyl- and stearyl-alcohol in water-free and water-containing form.

10780 N,N′-Dimethyl-N,N′-Dinitrosoterephthalamide Blow-Agent. Preparation of Poly(Vinyl Chloride) Foam at Atmospheric Pressure. Mack F. Fuller. *Industrial and Engineering Chemistry*, v. 49, Apr. 1957, p. 730-736.

A method for producing slab stock foam, batchwise or continuously, several inches thick, cored foam, foam formed on and bonded to substrata such as vinyl sheet and fabrics, and miscellaneous molded objects.

10781 The Polyethylene Resins. A Nomenclature Problem. H. F. Robertson. *Industrial and Engineering Chemistry*, v. 49, Apr. 1957, p. 51A-54A.

A statement of the problem, with several suggestions for eliminating the current confusion with generic and trade names.

10782* (French.) The Organic Fluorinated Compounds and Their Application in Electric Techniques. **Les composés fluorés organiques et leurs applications en électrotechnique.** A. Dehez. *Industrie Chimique Belge*, v. 22 ,Mar. 1957, p. 263-270.

A table permits comparison of the respective characteristics of polyethylene and of the principal fluorinated polyethylene derivatives. A new elastomer derived from polytrifluorochloroethylene is also described.

10783* Graft Copolymers. Norman G. Gaylord. *Interchemical Review*, v. 15, Winter 1956-57, p. 91-109.

Preparation and properties.

10784* (Russian.) Investigation in the Field of Low-Molecular Polymerization. **Issledovanie v oblasti nizkomolekuliarnoi polimerizatsii. II.** Interaction Between Some Vinyl Ethers and Carbon Tetrachloride Under the Influence of Different Initiators. **Vzaimodeistvie nekotorykh prostykh vinilovykh efirov s chetyrekhkhloristym uglerodom pod vliianiem razlichnykh initsiatorov.** A. V. Bogdanova and M. F. Shostakovskiĭ. *Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk*, no. 2, Feb. 1957, p. 224-229.

A study of the condition of interaction of simple vinyl ethers with CCl_4 under the influence of various reagents and factors that initiate a reaction with the free radical.

10785 Dynamic Mechanical Properties of Polyhexene-1. Sheldon F. Kurath, Elio Passaglia, and Rudolph Pariser. *Journal of Applied Physics*, v. 28, Apr. 1957, p. 499-502.

A double electromagnetic transducer was used to evaluate the complex shear modulus of polyhexene-1 from +70 C to −27.5 C in the 25 to 2500 c.p.s. frequency range. Real and imaginary components of the complex shear modulus as well as the mechanical loss tangent are reported over nine decades of reduced frequency.

10786 Vibration Spectrum and Heat Capacity of a Chain Polymer Crystal. S. M. Genensky and G. F. Newell. *Journal of Chemical Physics*, v. 26, Mar. 1957, p. 486-497.

10787 Viscoelastic Theory of Branched and Cross-Linked Polymers. Joe S. Ham. *Journal of Chemical Physics*, v. 26, Mar. 1957, p. 625-633.

A model of polymer chain motions is developed which in the limit of long, flexible chains can readily be applied to branched chain and cross-linked systems.

10788 Study of Nickel Oxide-Kieselguhr Catalyst. II. The Participation of Physically Adsorbed Molecules in Propylene Polymerization at 0°. Shinichi Kawaguchi. *Journal of Physical Chemistry*, v. 61, Apr. 1957, p. 394-399.

The so-called Zeldowitch equation was found to fit the course of polymerization of propylene at zero C.

10789 Mechanism of High Energy Radiation Effects in Polymers. Robert Simha and Leo A. Wall. *Journal of Physical Chemistry*, v. 61, Apr. 1957, p. 425-430.

Proposes a series of elementary processes for crosslinking and scission reactions based on free radical intermediates.

10790* Condensation Polymers Containing Fluorine. I. Synthesis of Linear Polyesters From Fluorine-Containing Diols. George C. Schweiker and Paul Robitschek. *Journal of Polymer Science*, v. 24, Mar. 1957, p. 33-41.

The most suitable method consists of reacting the fluorine-containing diols with dicarboxylic acid chlorides. The polymers are rubberlike gums or waxy solids, depending on the reactants used. Increasing amounts of fluorine, contained either in a pendent group or on the backbone chain of the polymers, decreases their solubilities in common solvents, and raises their brittle temperatures.

10791* Ionic Grafting. Howard C. Haas, Pandurang M. Kamath, and Norman W. Schuler. *Journal of Polymer Science*, v. 24, Mar. 1957, p. 85-92.

When styrene was polymerized in the presence of poly-p-methoxystyrene (PPMS), a graft copolymer was readily obtained. Data obtained on the styrene-PPMS system are discussed in terms of a simple kinetic scheme.

10792* Viscosity of Dilute Solutions of Polyvinyl Alcohol. Masakazu Matsumoto and Kiyokazu Imai. *Journal of Polymer Science*, v. 24, Mar. 1957, p. 125-134.

10793* Some Solution Properties of Isotactic and Atactic Polystyrenes. Ferdinando Danusso and Giovanni Moraglio. *Journal of Polymer Science*, v. 24, Apr. 1957, p. 161-172.

Reports results of viscometric and osmotic measurements and solubility experiments with isotactic and atactic polystyrene fractions; MEK is shown to be a selective solvent in the separation of the two types of polystyrene.

10794* Specific Heat of Synthetic High Polymers. VIII. Low Pressure Polyethylene. Bernhard Wunderlich and Malcolm Dole. *Journal of Polymer Science*, v. 24, Apr. 1957, p. 201-213.

Marlex 50, a low pressure polyethylene, is studied over the range −25 to 150 C.

10795* The Growth of Single Crystals of Linear Polyethylene. P. H. Till, Jr. *Journal of Polymer Science*, v. 24, Apr. 1957, p. 301-306.

Portrays crystals, grown from very dilute solutions of xylene, by electron microscopy and electron diffraction.

10796* (Russian.) Varying the Molecular Structure of High Polymers by the Inclusion Method. **Izmenenie molekuliarnoi struktury vysokopolimerov metodom inkliudirovaniia.** A. N. Bykov and A. B. Pakshver. *Kolloidnyi Zhurnal*, v. 19, Jan.-Feb. 1957, p. 27-30.

Incorporation of an indifferent substance into the molecular structure of a polymer, preliminarily weakened by a compound causing the swelling of the molecules, may produce a looser structure. Inclusion increases the reactivity, considerably raising the rate of sorption by polyamides of dyes and acids, and by acetyl cellulose and cellulose of dyes.

10797* (Russian.) The Compatibility of Nitrocellulose and Butadiene Nitrile Copolymers. **Sovmestimost' nitrotselliulozy s butadiennitrilnymi sopolimerami. III.** The Dependence of the Vitrification Temperature and the Flow of Nitrocellulose Films on the Content of Different Butadiene Nitrile Copolymers. **Zavisimost' temperatur steklovaniia i techeniia nitrotselliuloznykh plonok ot soderzhaniia v nkh razlichnykh butadiennitril'nykh sopolimerov.** L. E. Kalinina, V. I. Alekseenko, and S. S. Voiutskii. *Kolloidnyi Zhurnal*, v. 19, Jan.-Feb. 1957, p. 51-58.

Copolymers with a large number of acrylonitrile groups are compatible with nitrocellulose and exert upon it an elasticizing and plasticizing action.

10798* (Russian.) The Effect of Hydrophilic Plasticizer Additions on the Properties of Concentrated Suspensions. **Vliianie dobavok gidrofilnogo plastificatora na svoistva kontsentrirovannykh tsementnykh suspenzii.** O. I. Luk'ianova, E. E. Segalova, and P. A. Rehbinder. *Kolloidnyi Zhurnal*, v. 19, Jan.-Feb. 1957, p. 82-89.

10799* (Russian.) The Electrochemistry of High Polymer Dispersions. **Elektrokhimiia dispersii vysokopolimerov. III.** The Effect of pH on the Electrokinetic Potential of Synthetic Latex Globules. **Vliianie pH na elektrokineticheskii potentsial globul sinteticheskikh lateksov.** R. M. Panich and S. S. Voiutskii. *Kolloidnyi Zhurnal*, v. 19, Jan.-Feb. 1957, p. 113-117.

10800* (German.) The Polyethylene Structure. **Zur Struktur des Polyäthylens.** A. Schram. *Kolloid-Zeitschrift*, v. 151, Mar. 1957, p. 18-24.

Study of a basic structure formation common to the spherulite types determined in different linear high polymers. Effect of thermal conditions. Radial growth produced by a seed in the melt.

10801* (German.) The Chain Molecule Degradation Theory. **Zur Theore des Abbaus von Kettenmolekülen.** *Kolloid-Zeitschrift*, v. 151, Mar. 1957, p. 24-27.

In the case of statistical decomposition, measuring the average degree of polymerization is not enough to establish a definite degradation mechanism. The time in connection with the entire distribution should be known.

10802* (German.) "Novodur." **Novodur.** P. Schneider and A. Wunderer. *Kunststoffe*, v. 47, Apr. 1957, p. 147-151.

Novodur is a plastic material based on copolymers of butadiene, styrene, and acrylonitrile. Modifying agents produce a considerable increase in elongation and notched bar impact strength compared with polystyrene. Chief applications are in pipes used in petroleum production and refining and in the manufacture, by injection molding, of high impact parts for electrotechnical purposes, and the textile and automobile industries.

10803* (German.) Concerning PVC Pastes and Their Adherence to Metal Surfaces. **Über PVC-Pasten und deren Verankerung auf Metalloberflächen.** Heinrich Koch and Werner Sommer. *Kunststoffe*, v. 47, Apr. 1957, p. 153-156.

Determination of influence of particle shape, size, and size distribution on the viscosity of PVC pastes, using torsion viscometer measurements. Some results concerning the keying of plasticized PVC coatings to Fe and Al are given.

10804* (German.) Short-Term Tensile Strength and Elongation of Rigid Thermoplastics. **Kurzzeit-Zugfestigkeit und-Dehnung von harten thermoplastischen Kunststoffen.** Heinz Peukert and August Kleine-Albers. *Kunststoffe*, v. 47, Apr. 1957, p. 167-179.

10805* (German.) Injection Molded Polyamide Parts Having a Uniform Finely Crystalline Structure. **Polyamid-Spritzgussteile mit gleichmässig feinkristallinem Gefüge.** F. Förster and B. Olsen. *Kunststoffe*, v. 47, Apr. 1957, p. 213-217.

New special formulations with improved crystalline properties may be converted economically into moldings by injection molding, and are characterized by uniformity, freedom from stress, surface hardness, and good abrasion resistance.

10806* (German.) Phthalic Acid Ester as Plasticizer for Polyvinyl Chloride. **Phthalsäureester als Weichmacher für Polyvinylchlorid.** R. Reichherzer. *Mitteilungen des Chemischen Forschungsinstitutes der Wirtschaft Österreichs*, v. 11, Feb. 1957, p. 5-11.

An attempt to determine reactions of esters of phthalic acids from their constitution and physical values. Brabender's plastograph has proven to be an extremely useful instrument for this purpose. (To be continued.)

10807 Permeability of Polyethylene to Gases and Vapors. A. W. Myers, C. E. Rogers, V. Stannett, and M. Szwarc. *Modern Plastics*, v. 34, May 1957, p. 157 + 5 pages.

Effects of crystallinity, irradiation, a paper substrate, and of grafting other monomers on to the polyethylene by irradiation in the presence of monomer.

10808* (English.) **Proton Magnetic Resonance in Chain Polymers.** Akira Odajima, Junkichi Sohma, and Mitsuru Koike. *Physical Society of Japan, Journal*, v. 12, Mar. 1957, p. 272-282.

10809* (English.) **Nuclear Magnetic Resonance in Some Crystalline Polymers.** Atsuo Nishioka, Hachiro Komatsu, and Yoshinobu Kakiuchi. *Physical Society of Japan, Journal*, v. 12, Mar. 1957, p. 283-285.

Study covered the temperature range from liquid air temperature to the neighborhood of the melting points of the samples.

10810 Experiments on Controlled Fractures. J. J. Benbow and F. C. Roesler. *Physical Society, Proceedings*, v. 70, no. 446B, Feb. 1957, p. 201-211.

Specimen is a flat strip, which is split lengthwise by gradually propagating a crack down the middle. The crack is made stable in direction by holding the specimen in a state of lengthwise compression. Measurements on plastics show that crack propagation is governed by a constant specific fracture energy, which is invariant with respect to scale transformations of the stresses.

10811* (German.) Some Experience With Halogen-Containing Softener for PVC. **Einige Erfahrungen über die Wirksamkeit halogenhaltiger Weichmacher für Polyvinylchlorid.** K. Thinius and W. Schwarz. *Plaste und Kautschuk*, v. 4, Feb. 1957, p. 48-51.

Reviews halogen-containing softeners used in Europe and U. S. A., illustrating with a comparative table and discussing their properties. Treats the problems of preparation and application of diphenyl halogen derivatives.

10812* The Effect of Gating on Molding Linear Polyethylene. F. J. Rielly, V. Hill, and D. A. Jones. *SPE Journal*, v. 13, Apr. 1957, p. 28-31.

Gate size and design have a profound effect on direction of shrinkage and impact strength of molded polyethylene.

10813* Glass-Flake Laminates. George Rugger. *SPE Journal*, v. 13, Apr. 1957, p. 35 + 3 pages.

Chief advantages of flake glass reinforced laminates are extreme stiffness, energy absorption ability, and economy.

10814* Pre-Impregnated Reinforcements for Epoxy Laminates. B. E. Godard, P. A. Thomas, and J. L. Welch. *SPE Journal*, v. 13, May 1957, p. 26-31.

Dry layup of pre-impregnated reinforcement-epoxy offers many advantages. Handling and curing techniques, and properties of finished products are described.

10815* Property-Structure Relationships in Polyethylene. G. N. B. Burch, G. B. Feild, F. H. McTique, and H. M. Spurlin. *SPE Journal*, v. 13, May 1957, p. 34-37.

10816 Supplement to Bolt-Bearing Properties of Glass-Fabric-Base Plastic Laminates. Robert L. Youngs. *U. S. Department of Agriculture, Forest Products Laboratory, Report No.* 1824-C, Feb. 1957, 30 p. (TS800 Un3.3r Contin.)

Laminates of either ¼ or ⅜ in. thickness were tested both dry and wet, at angles of 0, 90, and 45° to the warp direction. Effects of edge and side distance are included.

10817* (German.) Structural Conditions and Forces in High Polymers, and Their Importance for the Technical Properties of the Polymers. **Ordnungszustände und Kräfte in Hochpolymeren und deren Bedeutung für die technischen Eigenschaften der Hochpolymeren.** Kurt Altenburg. *Wissenschaftliche Annalen*, v. 6, Mar. 1957, p. 154-169.

Structural principles and reactions of macro-molecules and polymers; relationships between structural conditions, intermolecular forces, and technical properties.

10818 Dielectric Dispersion Behavior of Selected Natural Polymers. John L. Cooney, Charles F. Ferraro, John J. Maurer, and Walter T. Zagar. *Wright Air Development Center Aeronautical Research Laboratory, WADC Technical Report* 56-577, Jan. 1957, 161 p. (TL507 Un3.18w Vis.)

The dielectric constant of loss factor for 20 plasticized amylopectin acetate systems from −70 to +80 C and at frequencies from 0.1 to 100 kc. are presented.

10819* (Russian.) A Study of the Polymerization of *p*-tert-Butylphenylmethacrylate. **Izuchenie polimerizatsii *p*-tretichnozo butilfenilmetakrilata.** S. E. Bresler, T. V. Sheremeteva, S. Ya Frenkel', and M. G. Zhenevskaya. *Zhurnal Fizicheskoi Khimii*, v. 31, Jan. 1957, p. 109-116.

Comparison of the rate curves and the mol. wt. distributions revealed the importance of secondary reactions between the macroradicals. The secondary reactions lead to the formation of branched chains, inhibition of these reactions giving more ordered linear structures. The side reactions may be inhibited by carrying out the polymerization at sufficiently high rates.

10820* (Russian.) Derivation of Polyethylsiloxanes With Linear Structure. **Poluchenie polietilsiloksanov lineinoi struktury.** K. A. Andrianov, I. A. Zubkov, T. A. Krasovskaia, and M. A. Kleinovskaia. *Zhurnal Obshchei Khimii*, v. 27, Feb. 1957, p. 491-494.

New ethylsiloxane linear polymers were obtained with the general formula $(C_2H_5)_3SiO\,[Si\,(C_2H_5)_2\,O]_n\,Si(C_2H_5)_3$, where n=1,2, or 3.

10821* (Russian.) Emulsion Copolymerization of Vinylidene Chloride With Vinyl Chloride. **Emul'sionnaia sopolimerizatsiia khloristogo vinilidena s khloristym vinilom.** I. P. Loser and G. Ia. Gordon. *Zhurnal Prikladnoi Khimii*, v. 30, Jan. 1957, p. 114-119.

The change in composition of vinylidene chloride with vinyl chloride prepared as a water emulsion in the presence of persulfate with variable transformation grades, is in conformity with a simplified equation of copolymerization. A decrease in the amount of the actually bound vinylidene chloride can be explained by the side chain reaction connected to the consumption of this monomer, because of the formation of low-molecular substances.

10822* (Russian.) Spectral Investigations in the I.R. Region of Polymethylene and Products of Its Transformation Into a Three-Dimensional Polymer. **Spektral'nye issledovaniia v infrakrasnoi oblasti polimetilena i productov ego prevrashcheniia v trekhmernyi polimer.** A. Ia. Drinberg, N. S. Demchenko, O. N. Setkina, and N. M. Gopshtein. *Zhurnal Prikladnoi Khimii*, v. 30, Jan. 1957, p. 120-124.

The I. R. spectrum of the three-dimensional polymethylene polymer differs from that of the linear polymer by showing new bands in the regions of 1700 $cm.^{-1}$ and 1200-1100 $cm.^{-1}$.

10823* (Russian.) Production of Polyacrylonitryl Fiber. Nitron (Nitrilon). **K voprosu o tekhnologii poliakrilonitrilovogo volokna Nitron (Nitrilon).** E. S. Roskin. *Zhurnal Prikladnoi Khimii*, v. 30, Jan. 1957, p. 124-130.

10824* (Russian.) Preparation of Adhesive Urea-Formaldehyde Resins. **Poluchenie kleiashchikh mochevino-formal'degidnykh smol.** R. Z. Temkina. *Zhurnal Prikladnoi Khimii*, v. 30, Jan. 1957, p. 154-159.

See also: **9721** (isocyanate polymers); **9965** (electric insulation); **9978** (electric insulation); **10314** (radiation copolymerization); **10673** (deuteron bombardment of Teflon).

POLLUTION AND WASTES

10825 Third Technical Progress Report. W. L. Faith, N. A. Renzetti, and L. H. Rogers. *Air Pollution Foundation, Report No.* 17, v. 2, Mar. 1957, 110 p. (TD884 Ai71.3r Vis.)

Technical activities of the Foundation during 1956 are summarized. Specific projects reported deal with the evaluation and control of sources of pollutants, atmospheric measurements, and the chemistry of polluted atmospheres.

10826 Eye Irritation From Irradiated Auto Exhaust. E. A. Schuck. *Air Pollution Foundation, Report No.* 18, v. 2, Mar. 1957, 85 p. (TD884 Ai71.3r Vis.)

Describes results of tests in a 520 cu. ft. artifically irradiated test chamber with controlled levels up to 2900 p.p.m. of auto exhaust. An evaluation panel of five subjects determined that irritation occurred only after irradiation of levels above 1000 p.p.m., especially with deceleration gases.

10827 Reactions of Auto Exhaust in Sunlight. F. V. Morriss and Calvin Bolze. *Air Pollution Foundation, Report No.* 19, v. 2, Mar. 1957, 71 p. (TD884 Ai71.3r Vis.)

Work was done in a 2200 cu. ft. greenhouse in natural sunshine. Gas was generated by an attached auto in good working order operated at idling speed. Auto exhaust in normal atmospheric concentration produces both oxidant and eye irritant environment. Irritant effect increases with exhaust concentration.

10828 Air and Water Pollution. The Position in Europe and in the United States. 218 p. 1957. European Productivity Agency of the Organisation for European Economic Co-operation, Paris. (TD897 Or3.2a)

General practice; observations from visits to various types of industrial plants; research work; recommendations.

10829 Microdetermination of Toluenediisocyanates in Atmosphere. Kalman Marcali. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 1, p. 552-558.

Colorimetric method depends upon hydrolysis of the toluenediisocyanate to the corresponding diamine, diazotization, coupling to *N*-1-naphthylethylenediamine, and final color measurement at 550 mμ.

10830 Air Pollution. Kingsley Kay. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 2, p. 589-604.

Review of industrial applications of analysis, control, and instrumentation. Includes 498 references.

10831* Spread of Particulate Contamination From Stacks. William B. Harris. *Archives of Industrial Health*, v. 15, Apr. 1957, p. 274-283.

Recent advances in the prediction of particulate concentration and deposition from elevated point sources including means for approximating average concentrations and meteorologic parameters.

10832* Treatment of Highly Active Wastes. C. B. Amphlett. *Atomics & Nuclear Energy*, v. 8, Apr. 1957, p. 116-120.

Three proposed methods are: fixation by ion-exchange followed by firing; combined calcination and ion-exchange; conversion to unleachable glasses, melts, or ceramics.

10833* (German.) The Requirements of Process Technology in Maintaining Pure Air. **Die Aufgaben der Verfahrenstechnik bei der Reinhaltung der Luft.** H. Lüder. *Chemie-Ingenieur-Technik*, v. 29, Mar. 1957, p. 143-151.

Methods for minimizing dust accumulation and air pollution.

10834* (Russian.) Precipitation of Aerosol Particles on a Streamlined Cylinder Under Effect of Electrostatic Forces. **Osazhdenie aerozol'nykh chastits na obtekaemom tsilindre pod deistviem elektrostaticheskogo pritiazheniia.** G. L. Natanson. *Doklady Akademii Nauk SSSR*, v. 112, Feb. 1, 1957, p. 696-699.

10835 Microscopic Dust. Sampling Methods Can Affect Size Estimations. A. J. Cruise. *Engineering*, v. 183, Mar. 22, 1957, p. 366-368.

Deposition patterns of dust particles and their effect on different sampling methods.

10836* (Czech.) Dust Separation From the Gases of Agglomeration Plants. **Odlučování prachu z kouřových plynů spékacích pásů.** Hynek Krumnikl. *Hutník*, v. 7, Mar. 1957, p. 74-81.

A study of the chemical composition and granulation of agglomeration plant gases and of various dust separation processes.

10837* Experiments on a New Type of Dust Separator for Steady and Pulsating Flow. H. A. Havemann and B. S. Bhaktavatsala Naidu. *Indian Institute of Science, Journal*, v. 39, sec. B, Jan. 1957, p. 23-51 + 3 plates.

Development and operational qualities of a cyclone dust separator characterized essentially by straight cylindrical walls and a conical insertion pointing upwards, in the lower part of the body of the separator supported by the cover plate of the dust bunker.

10838* (German.) Harmful Effects on Health Caused by Exhaust Gases From Internal Combustion Engines. **Die gesundheitlichen Schädigungen in der Luft durch die Auspuffgase der Verbrennungsmotoren.** Wilhelm Wilke. *MTZ; Motortechnische Zeitschrift*, v. 18, Jan. 1957, p. 13-16.

An exhaust purifier with catalytic after-burner is described.

10839 Concentration Changes in an Aerosol. E. R. Wooding. *Physical Society, Proceedings*, v. 70, no. 445B, Jan. 1957, p. 65-70.

Coagulation rate when there is a potential barrier round the aerosol particles is calculated and two examples are considered.

10840* California Fruit and Vegetable Cannery Waste Disposal Practices. Wm. J. O'Connell. *Sewage and Industrial Wastes*, v. 29, Mar. 1957, p. 268-280.

See also: **9479** (bacteria in air); **9614** (analysis of sulfite liquor); **9657** (determination of CO in air).

RUBBER AND ELASTOMERS

10841 Natural and Synthetic Rubbers. Max Tryon. *Analytical Chemistry*, v. 29, Apr. 1957, pt. 2, p. 714-721.

Review of recent literature on chemical and physical test methods pertaining to natural and synthetic rubbers.

10842* (German.) Effect of Fine-Particle Solids on Rubber and Rubber-Like Polymers. **Wirkung feinteiliger fester Stoffe auf Kautschuk und kautschukartige Polymere.** F. Endter and H. Westlinning. *Angewandte Chemie*, v. 69, Apr. 7, 1957, p. 219-226.

Fillers, carbon blacks as well as inorganic fillers, have an influence on curing and the technical properties of rubber, which depends not only on the chemical nature of the filler but also on its surface structure. The reciprocal action of filler-rubber is described and interpreted as a polarization phenomenon.

10843 Annual Report on the Progress of Rubber Technology. T. J. Drakeley, editor. v. XX. 141 p. 1956. W. Heffer & Sons, Ltd., Cambridge, England. (TS1870 I8an Vis.)

Papers cover production, properties, and utilization of rubber, with particular emphasis on individual applications.

10844 Viscosity of Natural Rubber Solutions at Very Low Rates of Shear. Morton A. Golub. *Canadian Journal of Chemistry*, v. 35, Apr. 1957, p. 381-387.

10845 (German.) Hypalon—New Synthetic Material. **Hypalon—ein neuer Kunststoff.** St. Reiner. *Chemiker-Zeitung*, v. 81, Apr. 1957, p. 203-205.

Chlorine and chlorosulfonic acid reacting with polyethylene result in formation of rubber-like, elastic material which after vulcanization has properties of soft rubber.

10846* (Russian.) Amination of Chlorinated Rubber. **Ob aminirovanii khlorkauchuka.** V. Kabaivanov, M. Mikhailov, and Kh. Karanova. *Doklady Akademii Nauk SSSR*, v. 112, Jan. 11, 1957, p. 267-270.

Effect of temperature on treatment of "Pergus S-90" chlorinated rubber with 63% Cl.

10847* (Russian.) Polymerization of Isobutylene in the Presence of Monofluorophosphoric and Difluorophosphoric Acids and a Molecular Compound of Monofluorophosphoric Acid With Boron Fluoride. **Polimerizatsiia izobutilena v prisutstvii monoftorfosfornoi i dftorfosforno kislot i molekuliarnogo soedineniia monoftorfosfornoi kisloty s ftoristym borom.** A. V. Topchiev and V. N. Andronov. *Doklady Akademii Nauk SSSR*, v. 112, Jan. 11, 1957, p. 279-282.

Polymerization at 15, 100, and 152 C over monofluorophosphoric acid on silica gel or activated C.

10848* (Russian.) On the Mechanism of Vulcanization With 2-Mercaptobenzothiazole. **O mekhanizme vulkanizatsii v prisustvii 2-Merkaptobenzotiazola.** B. A. Dogadkin, I. A. Tutorskii, and D. M. Pevzner. *Doklady Akademii Nauk SSSR*, v. 112, Jan. 21, 1957, p. 449-452.

Mercaptobenzothiazole marked by S^{35} in the thiazole ring was used. The S^{35} was not exchanged in vulcanization with elemental S. The vulcanization was studied in mixtures of natural rubber extracted and precipitated from a solution of benzene and sodium-butadiene rubber. In the vulcanized sample, the elemental linked S, extracted by means of acetone and entering into the composition of the accelerator, was examined by oxidation of the sample by mixing HNO_3 and Br_2 in the presence of MgO.

10849 New Polymers From Natural Rubber. Leslie C. Bateman. *Industrial and Engineering Chemistry*, v. 49, Apr. 1957, p. 704-711.

A new method for making graft polymers by milling offers possibilities in both rubber and plastics industries.

10850 Chlorination of Emulsion-Polymerized Polybutadiene Rubber. P. J. Canterino. *Industrial and Engineering Chemistry*, v. 49, Apr. 1957, p. 712-717.

Chlorinated polybutadiene has higher tensile strength and greater resistance to acid and alkali than chlorinated natural rubber. Products of partial chlorination of a butadiene-styrene copolymer may be vulcanized to compositions exhibiting unusually high tensile strength.

10851 Radiation Effect on Polymer Vibration Characteristics. C. D. Bopp, W. K. Kirkland, Oscar Sisman, and R. L. Towns. *Industrial and Engineering Chemistry*, v. 49, Apr. 1957, p. 718-721.

Cross linking of some elastomers can be induced by radiation changes which are then measured by vibration test methods.

10852* Tensile Strength of Rubbers. F. Bueche. *Journal of Polymer Science*, v. 24, Apr. 1957, p. 189-200.

A theory is presented which gives reasonable agreement with experimental data for natural and synthetic rubber.

10853* (German.) Vulcanization of High-Elastic Polymers. **Zur Kenntnis der vulkanisation hochelastischer polymerisate. XII.** Vulcanizing "Perbunan" With Thiurammonosulfide and Sulfur. **Die vulkanisation von Perbunan durch Thiurammonosulfid und Schwefel.** Walter Scheele and Horst-Eckart Toussaint. *Kautschuk und Gummi*, v. 10, Mar. 1957, p. WT51-WT57.

Vulcanization of "Perbunan 2818" by tetramethylthiurammonosulfide + sulfur. The yield of dithiocarbaminate is 66% and is independent of the temperature. It is carried out at 100 C in about 100 min.

10854 Natural Rubber Latex and Its Applications. V. The Applications of Latex to Textile and Allied Materials. C. M. Blow. 135 p. 1956. Natural Rubber Development Board, London. (TS1890 B62a)

Treatment of yarns, threads, and cords; fabric proofing, coating, and impregnation; adhesion of rubber to textiles; latex treatment of pile fabrics; artificial leather manufacture; latex applications to paper; miscellaneous processes and applications.

10855* (German.) Rubber Base Foam Materials. Production, Testing, and Use of Rubber With Cellular Structure. **Schaumstoffe auf Kautschukbasis. Herstellung, Prüfung und Verwendung von Gummi mit zelliger Struktur.** G. Saffran. *Plaste und Kautschuk*, v. 4, Jan. 1957, p. 28-30; Feb. 1957, p. 59-62.

10856* (German.) Infra-Red Spectroscopy as an Auxiliary Means of Rubber Research. **Die Ultrarotspektroskopie als Hilfsmittel der Kautschukforschung.** G. Hofmann. *Plaste und Kautschuk*, v. 4, Feb. 1957, p. 56-59.

Methods of investigation of the structure of polymers, their polymerization mechanism, aging, and oxidation processes. Determination of isorubber, cyclorubber, chlororubber, and rubber hydrochloride structures.

10857* (English.) **Viscosity-Gravity Constant and Viscosity of Rubber Processing Oils in Relation to Properties of Oil-Extended Rubber.** J. S. Sweely, S. W. Ferris, M. E. Peterkin, and S. S. Kurtz, Jr. *Revue Générale du Caoutchouc*, v. 34, Feb. 1957, p. 170-179.

It is recommended that, in selecting rubber processing oils for use in butadiene-styrene rubbers, a classification system based on viscosity and viscosity-gravity constant be used. Oils with viscosity-gravity constants between 0.850 or 0.950 and viscosities at 210 F of between 12 and 24 centistokes give good all-around performance.

10858 A Comparison of Instruments Used to Determine the Suitability of Elastomers for Low Temperature Service. I. Hardness. M. Hanok, C. K. Chatten, J. Z. Lichtman, and T. A. Werkenthin. *Rubber Age*, v. 81, Apr. 1957, p. 100-112.

Four spring-load and seven dead-weight instruments were evaluated for use in determining the hardness of elastomers at 74 F and at low temperatures.

10859 A Non-Blooming High Temperature Resistant Vulcanizing Agent for Natural and Synthetic Rubbers. K. R. Cranker and V. H. Perrine. *Rubber Age*, v. 81, Apr. 1957, p. 113-116.

Pertinent physical and chemical data on VA-7, a liquid used with GR-S type, nitrile, and natural rubbers.

10860* Curing Systems for Improved Aging Resistance of Rubber Vulcanizates. II. Z. T. Ossefort, R. F. Shaw, and E. W. Bergstrom. *Rubber World*, v. 136, Apr. 1957, p. 65-73.

Aging of sulfur and non-free sulfur compounds in absence of oxygen; aging of dicumyl peroxide and radiation-cured vulcanizates.

SPACE HEATING AND CONDITIONING

10861* Heating Houses by Electricity. W. J. Novak. *Air Conditioning, Heating, and Ventilating*, v. 54, Apr. 1957, p. 77-82.

Types of equipment; its operation, installation, and control; operating costs.

10862* Ventilation for Rolling Mill Motor Rooms and Motors. R. G. Plaisted and W. Y. Humphreys. *Air Conditioning, Heating, and Ventilating*, v. 54, Apr. 1957, p. 93-99.

10863* (German.) Processes for Producing Temperatures Below −100 C. **Verfahren zur Kälteerzeugung unter −100°C.** K. Nesselmann. *Chemie-Ingenieur-Technik*, v. 29, Mar. 1957, p. 198-200.

10864* High Velocity Air Distribution. W. F. Peters. *Heating & Air Conditioning Contractor*, v. 48, Apr. 1957, p. 73-76.

Principal advantage is saved space. Important design considerations are outlined.

10865 HTHW Heats Air Base Seven Ways. J. F. Gschwind and J. A. Bement. *Heating, Piping & Air Conditioning*, v. 29, Apr. 1957, p. 110-113.

Heating plant and distribution system are designed to distribute high temperature water at 410 F and 300 psi.g. There are two 31.2 million B.TU. per hr. boilers, connected to a common expansion drum. Distribution system consists of 11,500 ft. each of distribution and return piping.

10866 Velocities and Temperatures on Axis of Downward Heated Jet From 4-Inch Long-Radius ASME Nozzle. Rudiger Knaak. *Heating, Piping, & Air Conditioning*, v. 29, May 1957, p. 137-141.

10867* The Production of Cold by Means of Solar Radiation. Felix Trombe and Marc Foex. *Journal of Solar Energy Science and Engineering*, v. 1, Jan. 1957, p. 51-52.

Refrigerator functions by means of an intermittent ammonia cycle in which the ammonia solution is directly heated by solar radiation.

10868* Film Condensation of Vapor in a Horizontal Tube. Jack B. Chaddock. *Refrigerating Engineering*, v. 65, Apr. 1957, p. 36 + 10 pages.

An investigation of the average deterioration of the heat transfer coefficient under inside, rather than outside, condensation on horizontal tubes.

10869* Evacuated and Gas-Filled Insulation Systems. Foster C. Wilson. *Refrigerating Engineering*, v. 65, Apr. 1957, p. 57 + 4 pages.

Thermal conductivity data is given for various gases. Better insulating values are obtained with a smaller fiber diameter.

See also: **10927** (controlled atmosphere environment).

TEXTILES, FIBERS, LEATHER, AND PAPER

10870* The History of the Development of Fast Dyes. Fred Fordemwalt. *American Dyestuff Reporter*, v. 46, Apr. 8, 1957, p. P244-P249.

10871* Studies on the Reactive Groups of Collagen. II. Effect of the Reactive Groups on the Fixation of Certain Aldehydes. S. M. Bose and K. Thomas Joseph. *American Leather Chemists Association, Journal*, v. 52, Apr. 1957, p. 200-207.

The fixation of formaldehyde, acrolein, and crotonaldehyde by untreated collagen and several modified collagens (deaminated, deamidated, methylated, hypobromite-treated, acetylated, and benzoylated) and also by Ultramid 6A was studied in acid, neutral, and alkaline pH.

10872* The Wet Processing of Fabrics Containing Blends of Wool. H D. Edwards. *Fibres, Engineering and Chemistry*, v. 18, Apr. 1957, p. 127 + 4 pages.

Scouring; milling; dyeing; effect of processing on dimensional stability.

10873* The System Cellulose-Methanol. K. Lauer, J. E. Ayer, and Abdel Latif A. Seoud. *Journal of Polymer Science*, v. 24, Mar. 1957, p. 67-74.

Sorption of methanol on cotton and mercerized cotton; thermodynamic considerations; fiber structure.

10874 Modern Pulp and Paper Making. John B. Calkin, editor. 3rd Rev. Ed. 549 p. 1957. Reinhold Publishing Corp., New York. (TS1105 W77m3)

Modern equipment, processes, and methods are reviewed by outstanding authorities in their respective fields. Information on economics and general mill design is included.

10875* The Use of Protective Liners in Kraft Digesters. J. A. Adams, D. E. Covey, and C. H. Rimmer. *Pulp and Paper Magazine of Canada*, v. 58, Mar. 1957, p. 158-163.

Studded liner is easily and cheaply installed, and is easily renewable. Corrosion rate on parent shell was 0.010 in. per yr. compared to the previous rate of 0.046 in. on unprotected plate.

10876* (French.) A Comparative Study on the High Temperature Behavior of Cotton and Some Other Textile Fibers. **Étude comparative du comportement à température élevée du coton passivé et de quelques autres fibres textiles.** R. Specklin. *Revue Générale du Caoutchouc*, v. 34, Mar. 1957, p. 245-250.

Natural fibers, modified cottons, synthetic fibers (nylon and Perlon), and fabrics from the same were submitted to temperatures between 140 and 190 C for varying periods of time. The best results were noted for partly acetylated cotton (Crestline).

10877* Some Investigations Into the Application of Dyes to Acrylic Fibres. B. Kramrisch. *Society of Dyers and Colourists, Journal*, v. 73, Mar. 1957, p. 85-92.

Characteristics of polyacrylonitrile fibers. Methods of application of disperse, basic (including Perkin's Mauve), Deorlene, acid, metal-complex, and chrome dyes to acrylic fibers. Fastness properties.

10878* The Vegetable Tannage of Sheepskins. A Systematic Study of the Influence of Various Factors in the Tanning Process. III. The Physical Properties of the Leathers. M. F. Chambers, R. G. Mitton, and E. F. Nattrass. *Society of Leather Trades' Chemists Journal*, v. 41, Mar. 1957, p. 94-105.

10879* (English.) **Investigation of an Ethylhydroxyethyl Cellulose.** Ingemar Croon and Bengt Lindberg. *Svensk Papperstidning*, v. 60, Feb. 15, 1957, p. 82 + 2 pages.

Distribution of substituents was investigated by hydrolyzing the cellulose derivative to monomers and fractionating them. Glucose, five mono-substituted and three disubstituted ethers were isolated and characterized.

10880* (English.) **Studies on Finely Divided Wood. II. The Properties of Lignins Extracted With Neutral Solvents From Softwoods and Hardwoods.** Anders Björkman and Börje Person. *Svensk Papperstidning*, v. 60, Mar. 15, 1957, p. 158 + 11 pages.

10881* (Swedish.) Influence of Crush Resistance of the Corrugating Medium on Stiffness of Corrugated Board. **Inverkan av korrugeringspapperets krosstyvhet på wellpappens styvhetsegenskaper.** Yngve Dagel. *Svensk Papperstidning*, v. 60, Mar. 31, 1957, p. 211-216.

Two methods for determining crush resistance.

10882* **The Biochemistry of Lignin.** *Tappi*, v. 40, Apr. 1957, p. 209-306.

A group of papers on such subjects as structure and growth of the cambium; occurrence, synthesis, and testing of lignin precursors; mechanism of lignification; fungal degradation of lignin.

10883 Determination of Relative Viscosity of Nylon 6.6 Yarn in 90% Formic Acid. A. S. Smith. *Textile Institute, Journal (Transactions)*, v. 48, Mar. 1957, p. T86-T97.

10884* **Relation Between the X-Ray Angle of Cottons and Their Fiber Mechanical Properties.** L. Rebenfeld and W. P. Virgin. *Textile Research Journal*, v. 27, Apr. 1957, p. 286-289.

Highly significant correlations are found between the spiral angle and the extensibility properties of cotton fibers, as measured by single fiber elastic modulus and elongation to break.

10885* **An Analysis of Tearing Failure.** Richard Steele and Irving J. Gruntfest. *Textile Research Journal*, v. 27, Apr. 1957, p. 307-313.

Equation relates tear strength to force-elongation behavior.

10886* **Effects of Cobalt 60 Gamma Radiation on the Physical Properties of Textile Cords.** D. J. Harmon. *Textile Research Journal*, v. 27, Apr. 1957, p. 318-324.

Oxygen is a strong contributor to the degradation of physical properties in the presence of radiation.

10887 Wood Particle Board Handbook. E. S. Johnson, editor. 303 p. 1956. Industrial Experimental Program of the School of Engineering, North Carolina State College, Raleigh. (TS835 C19w)

Manufacturing equipment, methods, and economics; marketing; wood raw material; process and product variables.

See also: **10239** (electron microscopy of fibers); **10854** (applications of latex to textile and leathers).

WELDING AND JOINING

10888* (Russian.) Effect of Hydrogen on Formation of Cracks and on the Mechanical Properties of Titanium Welded Joints. **K voprosu o vliianii vodoroda na sklonnost' k treshchinam i mekhanicheskie svoistva svarnykh soedinenii titana.** S. M. Gurevich. *Avtomaticheskaia Svarka*, v. 10, Jan.-Feb. 1957, p. 8-13.

Even 0.05% H content in welded joints of pure Ti decreases resilience, slightly increases the strength, and lowers plasticity. The brittleness produced by H is eliminated by introducing into the joint elements such as Mo, thus stabilizing the βTi phase.

10889* **Pressure Welding in Practice.** R. F. Tylecote. *British Welding Journal*, v. 4, Mar. 1957, p. 113-120.

A summary of the practical applications of pressure welding in the last ten years, particularly those relating to the butt welding of tubes and sections in steel, and the joining of overlapping sheet material in Cu and Al alloys by pressing or rolling.

10890* **Hydrogen Contents of Mild and Alloy Steel Weld Deposits With Some Reference to the Effects of Hydrogen Embrittlement in Welded Joints.** P. D. Blake. *British Welding Journal*, v. 4, Mar. 1957, p. 146-154.

10891* **The Effect of Impurities in Argon on Inert-Gas Shielded-Arc Welds.** R. A. Cresswell. *British Welding Journal*, v. 4, Apr. 1957, p. 181-188.

Nitrogen impurity in Al-base alloys containing Mg interferes with welding by formation of Mg_3N_2 at N levels above .05%. Oxygen causes a gradual deterioration in surface quality, oxidation of the W electrode, and increased heat input with d.c. electrode negative supply. The increased heat obtained with 0.1 to 0.3% of O can result in up to eight times as much metal being melted without any change in current settings. This results in an increased speed of welding or a decrease in current consumption. Hydrogen causes serious porosity with Al and its alloys and Cu, above a level of 0.008%. Water vapor appears largely to dissociate in the arc, and the separate effects of O and H are obtained.

10892* **Ultrasonic Metal Joining.** J. Byron Jones and E. E. Weismantel. *Electrical Manufacturing*, v. 59, Apr. 1957, p. 125 + 5 pages.

Ultrasonic energy is being used in soldering, brazing, and welding. These processes are particularly applicable to specialized joining problems in electrical design. Improved joint reliability is achieved through elimination of flux, and cost savings can be effected by substituting Al for Cu in electrical assemblies.

10893* (Finnish.) It Is Possible to Manufacture a Standard Welding Electrode? **Onko mahdollistva valmistaa yleishitsauspuikko?** J. Schönberg. *Hitsaustekniikka Svetsteknik*, no. 2, Mar. 1957, p. 46 + 3 pages.

After describing the various characteristics of the different types of welding electrodes in use, the author comes to the conclusion that a standard electrode has still to be invented.

10894* **Switch to Welding Cut Costs on Circular Parts.** Robert N. Williams. *Industry & Welding*, v. 30, May 1957, p. 62 + 5 pages.

Welded design puts sound, strong metal exactly where it is needed, eliminating expensive machining. Welding procedures are outlined.

10895 Predicting Strength and Dimensions of Adhesive Joints. Harold Tombach. *Machine Design*, v. 29, Apr. 4, 1957, p. 113-120.

An analysis of four empirical methods for predicting strength and dimensions of simple metal-to-metal bonded joints.

10896 Special Welding Techniques. *Glenn L. Martin Company (U. S. Atomic Energy Commission)*, AECU-3174, Jan. 1955, 41 p. (UF767 U3au Contin.)

Techniques developed for the resistance welding of heat exchanger tube-to-headers have proven practical for the fabrication of representative heat exchanger configurations in accordance with the unusual specifications required for nuclear power applications.

10897* **Distortion and Residual Stress in Welded Units.** A. Lawless. *Mechanical World and Engineering Record*, v. 137, Apr. 1957, p. 159-163.

Summary of current practice in stress relief and distortion control.

10898* (Dutch.) Some Aspects of the Metal Bonding Process. **Enkele aspecten van het lijmen van metalen.** A. Hartman. *Metalen*, v. 12, Mar. 30, 1957, p. 98-105.

Advantages, disadvantages, and limitations of adhesive joining for structural applications. Influence of temperature on the strength of bonded lapjoints. Bond quality inspection by peeling, droplet, and ultrasonic tests.

10899 Improved Ductility in Titanium Welds. M. L. Kohn, G. E. Faulkner, and G. W. Bauer. *Metal Progress*, v. 71, Apr. 1957, p. 82-86.

The commercial α-β alloy with 6% Al and 4% V has deficient bend ductility when welded with filler metal of the same composition but much better ductility when welded with unalloyed Ti as filler metal, especially after a long anneal in the α-β phase region.

10900* How to Join Magnesium Alloys. R. L. Nelson. *Modern Metals*, v. 13, Apr. 1957, p. 42 + 3 pages.

Weld characteristics, arc welding techniques, and related operations.

10901* (German.) Inquiry Into the Applicability of the Copper-Phosphorus Solder. **Studien über die Anwendbarkeit des Kupfer-Phosphor-Lotes L Cu P8.** Erich Lüder. *Neue Hütte*, v. 2, Jan. 1957, p. 18-23.

Measurement of working temperature; soldering points; tensile tests of soldered wires; brazing of Cu, steel, Ni, and Cu alloys.

10902 Electroless-Plated Brazing Alloys. P. Patriarca, G. M. Slaughter, and W. D. Manly. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2243, Apr. 1957, 12 p. (UF767 U3o Contin.)

Electroless-plating process deposits a Ni-P brazing alloy that exhibits excellent wetability and flowability in conjunction with such high-temperature alloys as austenitic stainless steels or inconel when heated above the eutectic temperature in a dry H atmosphere.

10903* (French.) Arc Welding Soft Steel With Heavy Currents in a Protective Gas Atmosphere. **L'utilisation, pour les aciers doux, des procédés de soudage à l'arc électrique, à forte densité de courant, sous protection gazeuse.** A. Moreau. *Revue de la Soudure (Brussels)*, v. 13, no. 1, 1957, p. 1-11.

Description of two welding processes, one in argon, the other in CO_2 atmosphere, using uncoated electrodes in the absence of any flux. Application to soft steels.

10904* (French.) Study of an Automatic Welding Process in Carbon Dioxide. **Un nouveau procédé de soudage automatique sous atmosphère protectrice d'anhydride carbonique.** F. Danhier. *Revue de la Soudure (Brussels)*, v. 13, no. 1, 1957, p. 12-22.

Study of welding process with a visible arc in a protective gas atmosphere, with an electrode made of a metallic jacket and a continuous core of deoxidizers and an anhydrous slag.

10905* (German.) Oxy-Acetylene Welding of Copper Plates. **Die Azetylen-Sauerstoff-Schweissung von dicken Kupferblechen.** C. Stieler. *Schweissen und Schneiden*, v. 9, Feb. 1957, p. 43 + 6 pages.

Physical and chemical properties of Cu. Examination of the crystalline structure. Causes of faults. Welding of Cu in the German Railways.

10906* (German.) CO_2-Shielded Arc Welding of Steel. **Das Lichtbogenschweissen von Stahl mit CO_2 als Schutzgas.** P. C. van der Willigen and L. F. Defize. *Schweissen und Schneiden*, v 9, Feb. 1957, p. 50-59.

Investigation into the transfer of metal globules. Chemical reactions; advantages and disadvantages; procedure; mechanical properties.

10907* (German.) The Flash-Butt Welding of High Quality Joints Between Components of Copper and Aluminum. **Die Herstellung hochwertiger Verbindungen zwischen Kupfer und Aluminium durch Abbrenn-Stumpfschweissung.** Erwin Schneidmadl. *Schweissen und Schneiden*, v. 9, Feb. 1957, p. 59-64.

Difficulties encountered in flash-butt welding Cu to Al. A flash-butt welding machine with a newly developed control. Use of a protective gas. Testing of the welds.

10908* (German.) Testing Weldability. **Prüfung der Schweissempfindlichkeit.** P. Bettzieche. *Schweissen und Schneiden*, v. 9, Mar. 1957, p. 91-93.

Survey of existing test methods; factors influencing weldability. Possibilities of reducing the tendency to brittle fracture.

10909* (German.) Application of Hardness Testing in Welding Practice. **Anwendung der Härteprüfung in der Schweisstechnik.** N. Ludwig. *Schweissen und Schneiden*, v. 9, Mar. 1957, p. 98-102.

Survey of hardness testing methods. Correlation of hardness values with the results of other testing methods. Features and limitations of the indentation testing methods in general use. Main fields of application in welding practice.

10910* (German.) Rules for Testing Welded Joints of Non-Ferrous Metallic Materials. **Prüfverfahren für Schweissungen an Nichteisenmetallen.** H. W. Klein and G. Lenk. *Schweissen und Schneiden*, v. 9, Mar. 1957, p. 102-110.

Specifications for tests of welding procedures, and of welders and welding operators as well as tests of filler materials. Principles for preparation of German standard specifications and rules for determining tensile strength, workability, and sensitivity to brittleness and weld-cracking.

10911* (German.) The Testing of Brazing and Soldering Materials and of Silver Soldered and Brazed Joints. **Die Prüfung von Loten und Lötverbindungen zum Hart- und Schweisslöten.** J. Colbus. *Schweissen und Schneiden*, v. 9, Mar. 1957, p. 110-116.

10912 Welding Light-Gauge Mild Steel. C. R. Thatcher. *Sheet Metal Industries*, v. 34, Apr. 1957, p. 263-266.

Jigs, fixtures, and methods in arc welding refrigerator parts.

10913 Welding and Brazing Refractory Metals. II. F. G. Cox. *Steel Processing and Conversion*, v. 43, Apr. 1957, p. 199 + 7 pages.

Welding methods applicable to Mo, Nb, Ta, and Zr.

10914* (Russian.) Fluxes for Gas Welding of Magnesium and Its Alloys. **Fliusy dlia gazovoi svarki magniia i ego splavov.** L. V. Biriukova. *Svarochnoe Proizvodstvo*, no. 3, Mar. 1957, p. 10-11.

Attempts to determine optimum composition of flux. Tests made on a number of existing fluxes. Effects of various flux components on the weld. "MF-20" flux was found to be most satisfactory.

10915* (Russian.) Semiautomatic Welding in a Carbon Dioxide Atmosphere. **Primenenie poluavtomaticheskoi svarki v uglekislom gaze.** I. N. Gerasimenko and A. G. Vinnikov. *Svarochnoe Proizvodstvo*, no. 3, Mar. 1957, p. 15-17.

Description of the process as used at the Ordzhonikidge plant in Podol'sk. Materials used; equipment; construction of torches; welding conditions; areas of application; weld tests.

10916 Symposium on Solder. ASTM Special Technical Publication No. 189. 190 p. 1957. American Society for Testing Materials, Philadelphia. (TT267 Am35s)

Contains 16 papers on solders for various applications, soldering fluxes, and joint strength characteristics.

10917 The Application of Inert-Gas Tungsten-Arc Welding to Carbon-Steel Pipe. F. J. Pilia and R. W. Minga. *Welding Journal*, v. 36, Apr. 1957, p. 363-370.

Method results in consistently higher quality welds, can be applied to both small and large size piping, and requires less operator skill. Welding techniques and costs.

10918 Design and Technique Requirements for Arc Welding Titanium in Aircraft Applications. R. Meredith and B. L. Baird. *Welding Journal*, v. 36, Apr. 1957, p. 371-377.

Welds which meet aircraft standards can be produced if correct joint design, choice of alloy, tooling, and welding techniques are employed.

10919 Strength of Brazed Joints in Copper Alloys. W. H. Munse and J. S. Alagia. *Welding Journal*, v. 36, Apr. 1957, p. 177s-184s.

Room-temperature strength of lap and butt-type joints in Cu alloys, brazed with various filler metals.

10920 Studies of Upset Variables in the Flash Welding of Steels. E. F. Nippes, W. F. Savage, G. Grotke, and S. M. Robelotto. *Welding Journal*, v. 36, Apr. 1957, p. 192s-216s.

Influence of temperature gradient prior to upset, upset current density, and composition of material on the upset behavior determined for three steels of differing elevated-temperature strength.

See also: **9528** (ceramic adhesives); **10265** (resistance-welded tubing); **10325** (acid corrosion of steel welds); **10419** (heat treatment of steel welds); **10435** (effects of S on hot cracking of welds); **10473** (tests for welding materials); **10490** (properties of steel welds); **10499** (strength of Ti alloy welds); **10549** (sigmaphase in steel welds); **10574** (structure of cast iron welds).

MISCELLANEOUS

10921 Algebraic Geometry and Topology. A Symposium in Honor of S. Lefschetz. R. H. Fox, D. C. Spencer, and A. W. Tucker. 399 p. 1957. Princeton University Press, Princeton. (QA564 F83a)

Contains 23 research papers, most of which reflect current outgrowths of Lefschetz's work.

10922* Tables for Best Linear Estimates by Order Statistics of the Parameters of Single Exponential Distributions From Singly and Doubly Censored Samples. A. E. Sarhan and B. G. Greenberg. *American Statistical Association, Journal*, v. 52, Mar. 1957, p. 58-87.

10923* Tables for Tolerance Limits for a Normal Population Based on Sample Mean and Range or Mean Range. Sujit Kumar Mitra. *American Statistical Association, Journal*, v. 52, Mar. 1957, p. 88-94.

10924 Selecting the Best One of Several Binomial Populations. Milton Sobel and Marilyn J. Huyett. *Bell System Technical Journal*, v. 36, Mar. 1957, p. 537-576.

10925* (French.) Asymptotic Lines of Meromorphic Functions. **Sur les chemins asymptotiques des fonctions méromorphes.** Peter Seibert. *Comptes Rendus*, v. 244, Mar. 11, 1957, p. 1443-1445.

A study of asymptotic lines for which the asymptotic value is a fixed complexed number. There is a meromorphic function for which the classes of asymptotic lines form a space of a given structure.

10926 Contracts, Specifications and Engineering Relations. Daniel W. Mead. 3rd Rev. Ed. 427 p. 1956. McGraw-Hill, New York. (TA180 M46c3)

Various aspects of personal and ethical relations; use of English; letters, reports, contracts, and legal matters. Technical specifications are considered which are important for the engineers or architect starting his professional career.

10927* Controlled Atmospheric Environment in Relation to People, Animals and Plants. 43 p. 1957. University of Illinois, Urbana. (ZTH 7687 IL6c Ref.)

A list of publications by staff members of the University of Illinois and the State Natural History Survey Division.

10928* Directory of U. S. Government Inspection Services and Testing Laboratories. 130 p. 1951. General Services Administration, Washington, D. C. (T13 T28 Ref.)

10929* Factor Table for the First Ten Millions. Derrick Norman Lehmer. 476 p. 1956. Hafner Publishing Co., New York. (QA51 L52f)

Contains the smallest factor of every number not divisible by 2, 3, 5, or 7 between the limits 0 and 10,017,000.

10930 The First One Hundred and Fifty Years. A History of John Wiley and Sons, Incorporated, 1807-1957. 242 p. 1957. John Wiley & Sons, New York. (Z232 W64f)

Historical review of publications in various fields of science; concomitant developments in the company.

10931* (Italian.) Compressed Air Purification. **Depurazione dell'aria compressa.** *Fonderia*, v. 6, Feb. 1957, p. 65-69.

The use of mechanical driers, oil filters, automatic air escape, and coolants in connection with saturated compressed air having a dew point below 8 to 12 C.

10932 The Ford Foundation Annual Report, October 1, 1955 to September 30, 1956. 286 p. (Pamphlet)

Review of activities, including financial statements.

10933 (German.) Handbook of Laplace-Transformation. **Handbuch der Laplace-Transformation. v. II-III.** Application of Laplace Transformation. **Anwendungen der Laplace-Transformation.** Gustav Doetsch. 436 and 300 p. 1955 and 1956. Birkhäuser Verlag, Basel, Switzerland. (QA432 D67h)

A book written for mathematicians and engineers. While the theoretical bases of the Laplace Transformation were studied in volume I, volumes II and III deal with practical applications in the fields of applied mathematics. Volume II covers asymptotic expansion, complex inverse integrals, Mellin transformations, convergent expansion, linear differential equations with constant and variable coefficients, automatic control technique, and network and wave filter theory. Volume III deals with partial differential equations, integral equations, functions of the exponential type, and the half group theory.

10934* The Pattern of Somatic Response During a Repetitive Motor Task and Its Modification by Visual Stimuli. R. C. Davis, Arne Lundervold, and James D. Miller. *Journal of Comparative and Physiological Psychology*, v. 50, Feb. 1957, p. 53-60.

10935* Some Effects of Unequal Spatial Distribution on the Detectability of Radar Targets. Patricia E. Nicely and George A. Miller. *Journal of Experimental Psychology*, v. 53, Mar. 1957, p. 195-198.

When targets are much more probable in one area of a radar display than in another, there is a decline in sensitivity for the low-probability area and no decline for the high-probability area.

10936 Finding Equations to Fit Test Data. A. Bruce Cox. *Machine Design*, v. 29, Apr. 18, 1957, p. 153-160.

Suggested methods for building simple formulas for relationships between properties of materials.

10937 Woven-Wire Conveyor Belts. J. F. Reid. *Product Engineering*, v. 28, Apr. 1957, p. 181-184.

Applications, materials, weaves, reinforcing, selvages and cleats, guides and supports, drive and power requirements.

10938 Applications of Monte Carlo. Herman Kahn. *Rand Corporation, (U. S. Atomic Energy Commission)*, AECU-3259, Apr. 1954, 250 p. (UF767 U3au Contin.)

General principles of calculations with emphasis on reducing the amount of work involved.

10939 Roentgen Interpretation of Fractures and Dislocations. Joseph Levitin and Ben Colloff. 265 p. 1956. Charles C. Thomas, Springfield, Ill. (RD101 L57r)

Shows the position usually assumed by the common human bone fractures, the accepted position of reduction, and the usual time of immobilization.

10940 Expected Number of Maxima and Minima of a Stationary Random Process With Non-Gaussian Frequency Distribution. Franklin W. Diederich. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3960, Apr. 1957, 21 p. (TL570 Un3t)

Correction is based on the statistical moments of the process and its first two derivatives.

10941 Pipeline Transportation of Coal. Clarence A. Dauber. *Utilization*, v. 11, Apr. 1957, p. 21 + 4 pages.

Details of pipeline through which coal is pumped 108 miles across Ohio.

See also: **9551** (petroleum safety codes); **9911** (application of statistics in coating experiments).